

THE INDIGENOUS EARTHWORMS
(MEGASCOLECIDAE : OLIGOCHAETA)
OF TASMANIA

BY
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By B. G. M. JAMIESON

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SYNOPSIS

This paper raises the number of indigenous earthworms known from Tasmania to forty-eight, in ten genera. The genus *Perionychella* Michaelsen, 1907a, is re-established and extended to include lumbricine species with or without nephridial bladders and perichaetine, vesiculate species. The other species resemble the type-species in being perichaetine with avesciculate nephridia. All vesiculate species are included in the subgenus *Vesiculodrilus* Jamieson, 1973a, initially established as a genus for lumbricine, vesiculate species. *Perionychella* absorbs all Australian species of *Diporochoaeta*, which is now regarded as endemic in New Zealand, and a large portion of the residue of *Plutellus*, a genus which has been revised elsewhere. A check list of the two subgenera of *Perionychella* is given which lists twenty-three Tasmanian species. *Perionychella* is therefore the dominant genus in numbers of species in Tasmania, as in Victoria. Twelve of the Tasmanian *Perionychella* species are new species and a further five species are re-described, three of these from new material. Only *P. scolecoidea* (Spencer, 1895) was previously referred to the genus (*Michaelsen*, 1907a).

The remaining earthworm fauna consists of a new species and the first Tasmanian record of *Rhododrilus*; a new species, also the first record, of *Graliophilus*; the new genus *Pinguidrilus* erected for *Notoscolex tasmanianus* Fletcher; a species of *Woodwardiella* which, like the *Graliophilus* species, may be referable to *Perionychella*; eight species of *Cryptodrilus*, of which four

and one subspecies are new ; a new species of the formerly monotypic Victorian genus *Pseudocryptodrilus* ; a new monotypic genus *Hickmaniella* ; eight species of *Oreoscolex*, of which four are new, and three species provisionally referred to *Megascolex*, of which two are new. There is almost total specific endemicity in Tasmania, a single species, *Megascolex tasmanicus*, being questionably a junior synonym of a mainland species. In contrast only two of the ten genera are endemic, the remaining eight occurring on the mainland and five of these in Victoria, the region with the highest zoogeographic affinity with Tasmania. Noteworthy features of the Tasmanian fauna are the high species diversity relative to the area of the island (paralleled, however, in Victoria), the high proportion of primitive, chiefly perionychin genera and species ; and radiative evolution in the excretory system within the perionychin genus *Cryptodrilus* which has resulted in convergent acquisition of grades of organization characteristic of the tribes Dichogastrini and Megascolecini, these tribes being poorly represented in Tasmania.

INTRODUCTION

THE earthworms of Tasmania have not been reviewed since the original work of Spencer (1895). As a result of the kind cooperation of Mr A. J. Dartnall of the Tasmanian Museum and Art Gallery, Hobart, and of Dr J. L. Hickman of the Zoology Department, University of Tasmania, in placing their oligochaete collections at the author's disposal, the taxonomic and zoogeographic relationships of the Tasmanian earthworm fauna have been investigated and the number of known species from that island has more than doubled. The present paper is a report of these investigations.

Before the study was begun, the known oligochaete fauna of Tasmania consisted of six species of aquatic microdriles, twenty-three indigenous species of megascolecid earthworms, and introduced earthworms of the family Lumbricidae. The microdriles are the cosmopolitan and probably anthropochorous *Lumbriculus variegatus* (Muller, 1774) (Lumbriculidae) ; the endemic *Telmatodrilus multiprostatatus* and *T. pectinatus*, both of Brinkhurst 1971 ; *Antipodrilus davidis* (Benham, 1907) which also occurs in Australia and New Zealand ; the cosmopolitan *Limnodrilus udekemianus* Claparede, 1862 (all Tubificidae) ; and the species inquirenda, *Tasmaniaedrilus tasmaniaensis* Goddard and Malan, 1913 (Phreodrilidae).

The previously known indigenous earthworms are listed below under their original binomina. Generic identifications were rarely correct but the species are reassigned and all previous generic attributions are listed in the specific synonymies.

Species of Spencer, 1895 :

| | |
|---------------------------------|-----------------------------|
| <i>Cryptodrilus irregularis</i> | <i>Megascolides simsoni</i> |
| <i>polynephricus</i> | <i>bassanus</i> |
| <i>mortoni</i> | <i>Perichaeta tasmanica</i> |
| <i>hobartensis</i> | <i>moroea</i> |
| <i>campestris</i> | <i>richea</i> |
| <i>tesselatus</i> | <i>dikwynnina</i> |
| <i>insularis</i> | <i>solecoidea</i> |
| <i>ellisi</i> | <i>irregularis</i> |
| <i>wellingtonensis</i> | |
| <i>officieri</i> | |

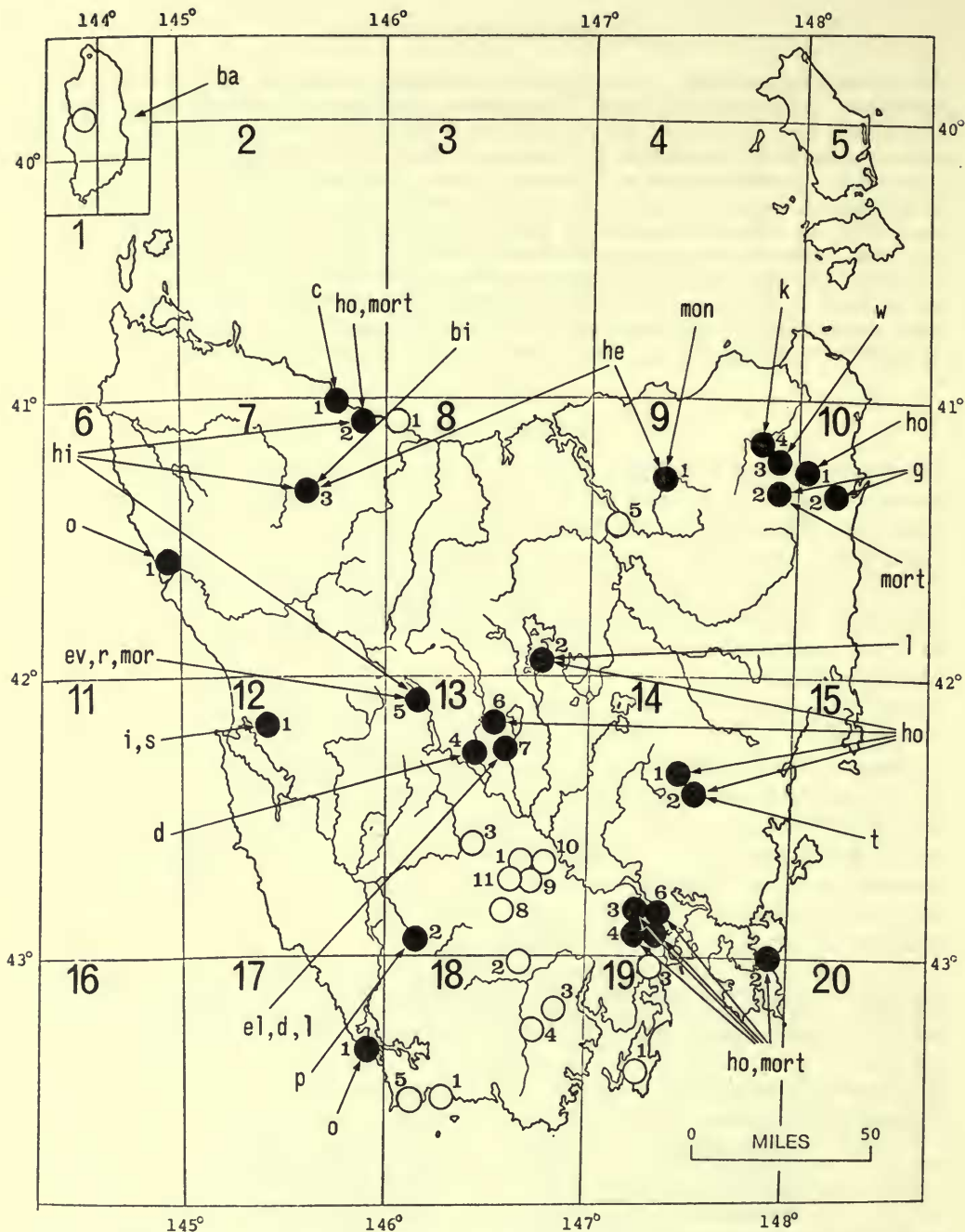


FIG. 1. Tasmanian records of *Perionychella* species. ●, present; ○, absent; ba, *P. bassana*; bi, *P. (V.) bithecata*; c, *P. (P.) capensis*; d, *P. (V.) dilwynnia*; el, *P. ellisi*; ev, *P. (V.) evansi*; g, *P. (V.) glandifera*; he, *P. (V.) hellyeri*; hi, *P. (V.) hickmani*; ho, *P. (V.) hobartensis*; i, *P. (P.) irregularis*; k, *P. (P.) kershawi*; l, *P. (P.) lacustris*; mon, *P. (V.) montisarthuri*; mor, *P. moroea*; mort, *P. (V.) mortoni*; o, *P. (V.) obliquae*; p, *P. (V.) pedderensis*; r, *P. richea*; s, *P. scolecoidea*; t, *P. (V.) tunnackensis*; w, *P. (P.) weldboroughi*. Not mapped: *P. decatheca*. (Numerals pertain to map references in text.)

Further species :

Notoscolex tasmanianus Fletcher, 1888b

Notoscolex leai Michaelsen, 1910

Megascolides albertsi Cognetti, 1910

Perionyx lacustris Stephenson, 1924

Plutellus decatheca Michaelsen, 1910

EXPLANATION OF DESCRIPTIVE FORMAT AND TERMINOLOGY

Those unfamiliar with oligochaete morphology and terminology are referred to Stephenson (1930) for what remains the most comprehensive account of this subject. It should be noted, however, that the taxonomy employed by Stephenson is now largely obsolete. In the following explanation of the format used in describing species in the present work some additional clarification of terminology will be given.

The descriptive format has been kept brief. Some characters, e.g. septal thickening, which are customarily described but are of limited value are omitted in favour of fuller treatment of systems of major significance in taxonomy which are frequently neglected, such as the excretory system. Some information retrievable from the illustrations, e.g. spermathecal proportions and dimensions, is excluded from the text.

These preliminary accounts are primarily limited to a holotype and paratype but variation, particularly in the highly species-specific genital fields, is appended. For species with eight setae per segment, setal ratios, which are population-specific (Jamieson and Bradbury 1972), are given for several specimens where these are available. Specimens are sexual, and usually clitellate, unless otherwise stated.

Characters employed, in sequence are as follows.

Dimensions : l = length, w = midclitellar, or greatest width where accounts are drawn only from the literature, s = number of segments. These and other numerical data are given in the sequence holotype and paratype 1. *Prostomium* whether epilobous or tanylobous and canaliculate (with middorsal longitudinal groove or not). *Body form* is mentioned only where the cross section departs from an approximate circle. The anus is terminal in all cases. Position of the *first dorsal pore* : determined by parting the intersegmental furrows with a probe or observing expulsion of alcohol when the specimen is immersed temporarily in water.

Setal ratios (intersetal distances) : the four setae on each side in a segment are designated, in the ventral to dorsal direction, a , b , c and d . The distances $aa : ab : bc : cd : dd : dc : cb : ba$, measured by camera lucida, are expressed in the tables relative to a constant total (periphery, u) of 100. Direct comparison of ratios between individuals without recourse to additional computations is also facilitated by stating the distances as ratios relative to one of the distances (ab) expressed as unity. Where there are more than eight setae per segment (the perichaetine condition), the longitudinal setal rows are designated, in the ventral to dorsal direction, setal line 1, 2, 3, etc. but the ventral two rows are alternatively termed a and b . The dorsalmost row, so as readily to indicate this position, is termed setal line z and the penultimate and next ventral rows are y and x respectively. Setae commence on segment II in all described species.

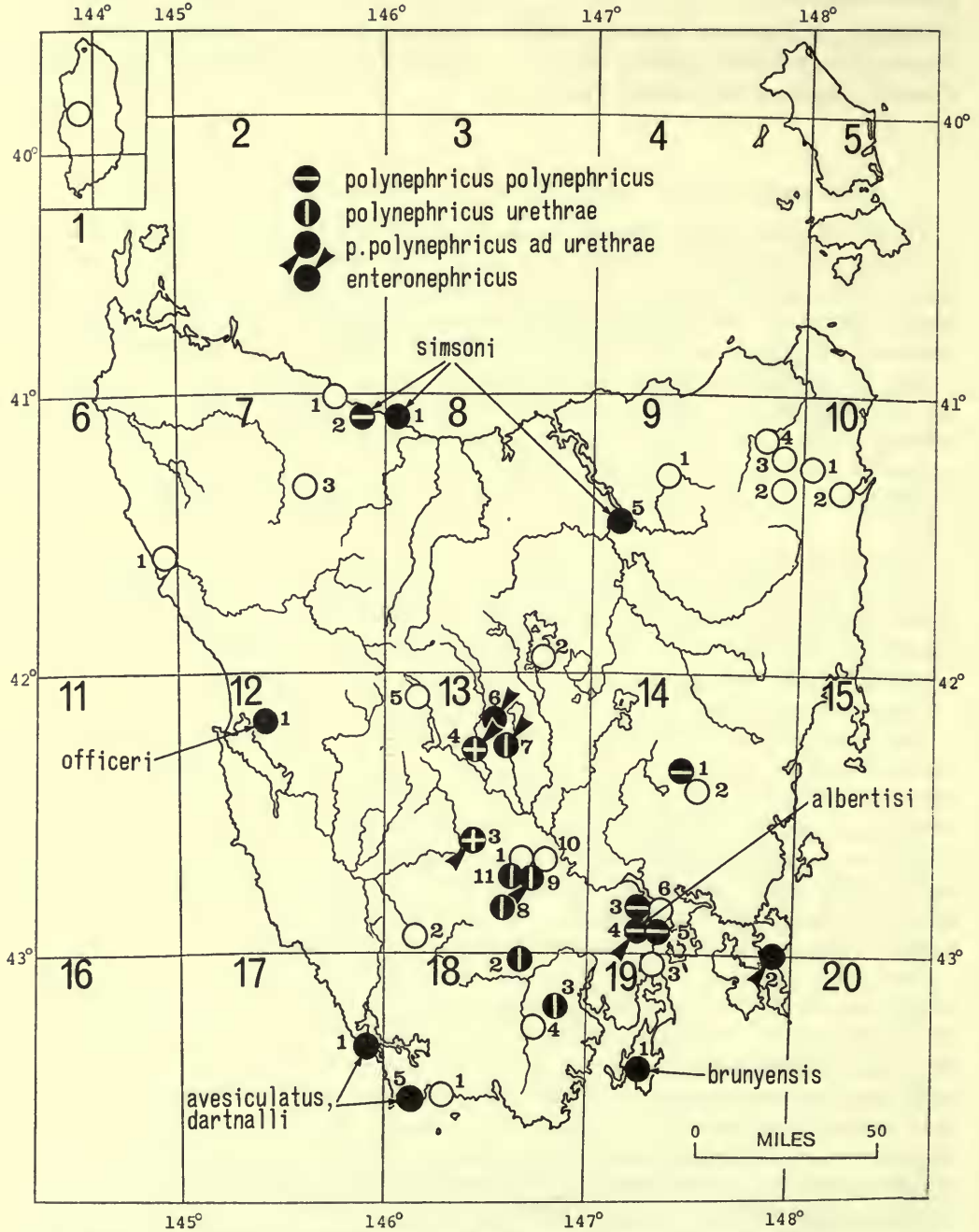


FIG. 2. Tasmanian records of *Cryptodrilus* species and subspecies. ●, present; ○, absent. (Numerals pertain to map references in text.)

Nephropores in holonephric Tasmanian species are invariably near the anterior margins of their segments. Their position relative to the setal lines is recorded.

The *clitellum* may be annular, i.e. completely encircling the body, or saddle-shaped, i.e. interrupted ventrally throughout its extent. Segmentation indicated as, for instance, XIII–XVII, indicates that the clitellum extends throughout the mentioned segments, in this case from the anterior border of the thirteenth to the posterior border of the seventeenth segment. A fractional indication, such as $\frac{1}{3}$ XIII– $\frac{2}{3}$ XVII, indicates the position on the segment at which the clitellum begins or ends, in this case the clitellum would include the posterior two-thirds of XIII and the anterior third of XVII. The *male genital field* is described next, including the position of the prophores bearing the combined pores of the vasa deferentia and the pair of prostate glands, and the form and configuration of accessory genital markings in their vicinity. These markings are usually protuberant, and where an elliptical marking has a distinct central area are described as eye-like. Other accessory genital markings may be present near the spermathecal pores. *Female pores* are without exception paired and anteromedian to setae *a* of segment XIV in Tasmanian species of *Perionychella* but their position is recorded for each species pending description of at least the entire Australian fauna. *Spermathecal pores* are intersegmental or segmental and paired or single in Tasmanian species; their number, intersegments or segments occupied and location relative to setal lines are indicated.

The internal anatomy (examined after middorsal longitudinal incision) is described in the following sequence. *Blood vascular system*: in all Tasmanian species the dorsal vessel is continuous onto the pharynx and a subneural vessel is absent; the segment occupied by the last hearts is given and the statement that they are latero-oesophageal refers to their origin from the supra-oesophageal vessel (or the oesophageal plexus). A latero-oesophageal heart usually also receives a connective from the dorsal vessel but this was not always demonstrable in the material examined. The extent of the *supra-oesophageal vessel* is indicated where precisely determinable; the stated degree of development of the vessel refers to the maximum development in its course. The account of the *alimentary canal* gives the segmental location and degree of development of the gizzard; modification of the oesophagus, including, where feasible, dilatation and internal specializations such as rugae and lamellae, and the position, if present, of extramural oesophageal (calciferous?) 'glands'; the segment of origin of the intestine (determined by intestinal expansion and, where possible, identification of the oesophageal valve between oesophagus and intestine) and presence or absence of a typhlosole. Special muscular thickening of the intestine is present only in *Hickmaniella*. Intestinal caeca are absent in all Tasmanian species of the Megascolecidae.

The types of *nephridia* found in oligochaetes are described by Jamieson (1971a). Nephridia are holonephridia in all species of *Perionychella*, *Gratiophilus*, *Pinguidrilus*, *Woodwardiella* and *Rhododrilus* but in some of these holonephric species anterior nephridia are tufted, having numerous tubules, with simple or less commonly composite or multiple ducts; it remains to be ascertained whether the tufted nephridia always retain the preseptal funnel (the stomate condition) of the simple nephridia. The most anterior segment in which the nephridia were seen to have preseptal funnels

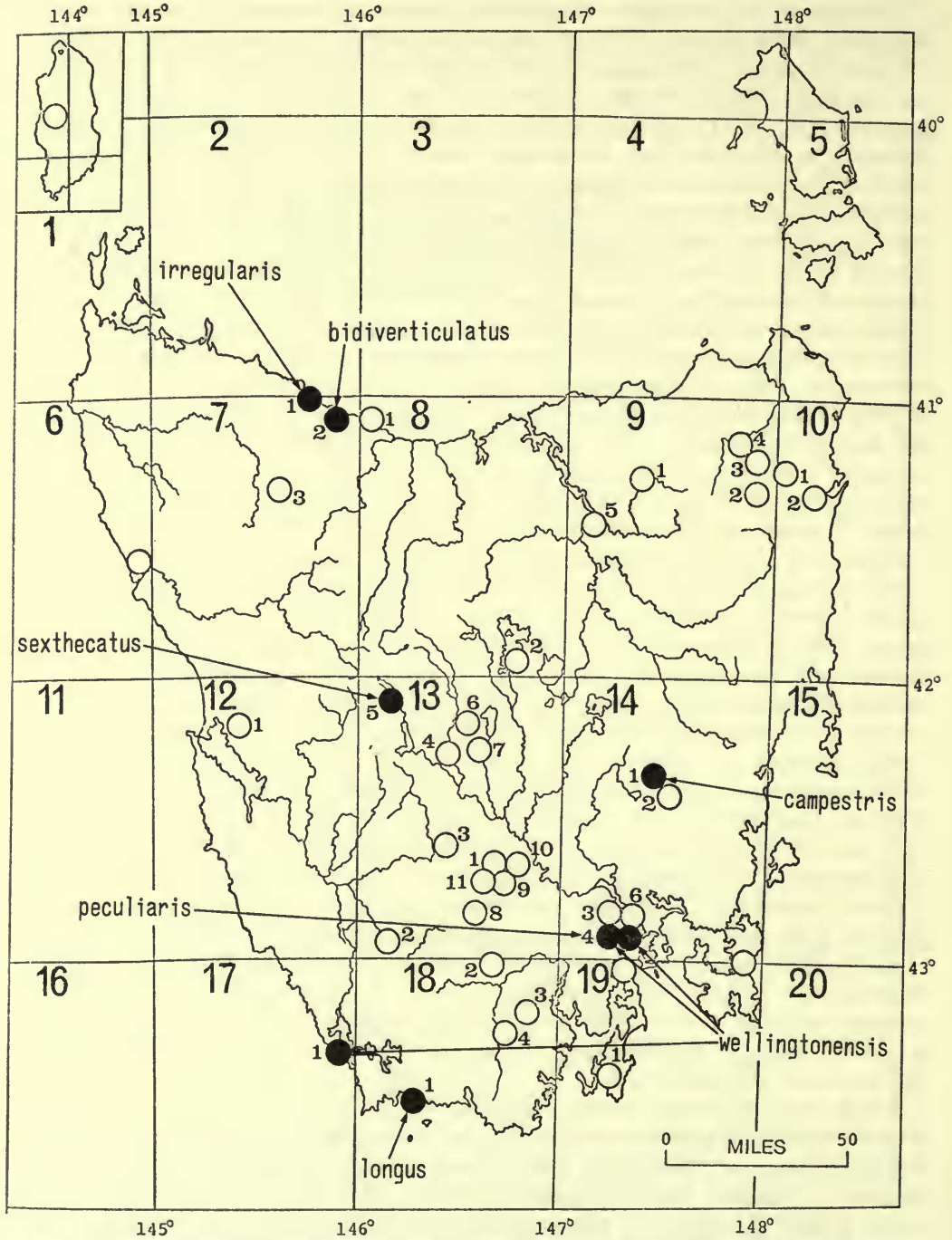


FIG. 3. Tasmanian records of *Oreoscolex* species. ●, present; ○, absent. Not mapped: *Oreoscolex leai*. (Numerals pertain to map references in text.)

is stated but it is not to be assumed that funnels were absent from more anterior nephridia as demonstration of funnels is difficult, particularly where disruption of other organ systems is undesirable. Presence or absence of ectal bladders, the vesiculate or avesiculate condition, and their form is recorded, as is the occurrence of diverticula on the bladders.

The *anterior male organs* are described next ; whether holandric (testes and funnels paired in each of X and XI) or metandric (these organs in XI only) and iridescence of the funnels is noted (an indication, albeit only partly reliable, that the organs are functional). Location of seminal vesicles is noted.

Female organs in Tasmanian megascolecids are metagynous (ovaries and funnels in XIII) as in all but a few species of the suborder Lumbricina of Brinkhurst and Jamieson 1971. This and the presence or absence of ovisacs (dependent from the anterior wall of XIV) is noted for each species.

The form and extent of the *prostate glands* are recorded ; variation in the form of these is discussed in the introductory discussion of *Perionychella*. *Penial setae* : occurrence of these enlarged copulatory setae in segment XVIII, associated with the male pores, is noted. Lengths of well-developed setae are given and their morphology as revealed by the light microscope and scanning electron microscope is briefly described. The penial setae in Tasmanian species of *Perionychella* are unusually slender and are at most only weakly ornamented, a contrast with other genera on the island, and reproduction of the electron microscope photographs is rarely merited. In several species of *Perionychella* complete or undamaged setae were not recoverable and the morphology could not be elucidated. A study of the degree of inter-specific variation in their ultra-morphology is required.

Finally, the number of *spermathecae* and the form and number of their diverticula are noted, detailed information being retrievable from the illustrations.

Material examined : Under this heading are given, in sequence, the locality with habitat data, the longitude and latitude of the locality, the grid reference on the map, the collector's name, the date of collection, and the institutions in which the holotype, paratypes and additional specimens are lodged. Letters and numbers following the abbreviation for the institution are the registration numbers of the institution. Lectotypes and paralectotypes are designations of Jensz and Smith (1969). Abbreviations for the institutions are given below and listed with them are the names of collectors.

Collectors

*Institutions in which specimens
are lodged*

| | | |
|-------------------------|--------|-------------------------------------|
| Mr E. A. Bradbury | AM | Australian Museum, Sydney |
| Mr A. Dartnall | BJ | Author's collections |
| Dr J. W. Evans | BM(NH) | British Museum (Natural History) |
| Dr J. L. Hickman | | |
| Professor V. V. Hickman | NMV | National Museum of Victoria |
| Mr W. Jackson | TM | Tasmanian Museum, Hobart |
| Dr B. G. Jamieson | | |
| Mr R. W. Kerr | | |

Collectors (cont.)

Mr R. C. Kershaw
 Mr C. D. King
 Mr W. Radford
 Tasmanian Biological Survey
 Mr D. Tyler

SYSTEMATICS

The generic and specific descriptions are arranged under the relevant subfamilies and tribes but a key to all Tasmanian genera, ignoring suprageneric ranks, will be given first. This key is intended only for known Tasmanian species of the genera concerned and should not be used as a general diagnostic key for these genera in other regions.

KEY TO THE GENERA OF TASMANIAN MEGASCOLECIDAE

- | | | |
|---|---|---------------------------------------|
| 1 | Combined male and prostatic pores a pair on XVII (16th setigerous segment). (Holonephric ; bladders absent) | RHODODRILUS |
| - | Combined male and prostatic pores a pair on XVIII (17th setigerous segment). (Holonephric or meronephric ; bladders present or absent) | 2 |
| 2 | Nephridia one pair per segment (holonephridia) in midbody | 3 |
| - | Nephridia more than one pair per segment (meronephridia) in midbody | 6 |
| 3 | Nephridial bladders present | 4 |
| - | Nephridial bladders absent | 5 |
| 4 | Nephridia discharging in irregular rows, from <i>c</i> to near middorsum. Spermathecae adiverticulate | PINGUIDRILUS |
| - | Nephridia discharging in a straight line, in the vicinity of <i>c</i> lines. Spermathecae diverticulate | PERIONYCHELLA (VESICULODRILUS) |
| 5 | Intestinal typhlosole present GRALIOPHILUS (part ; see also WOODWARDIELLA) | |
| - | Intestinal typhlosole absent | PERIONYCHELLA (PERIONYCHELLA) |
| 6 | Nephridia 2 or 3 on each side except at the caudal extremity which is holonephric | PSEUDOCRYPTODRILUS |
| - | Nephridia more than 2 per segment throughout | 7 |
| 7 | Setae more than 8 per segment | 8 |
| - | Setae 8 per segment | 9 |
| 8 | A gizzard present at the beginning of the intestine. Oesophageal gizzard also present | HICKMANIELLA |
| - | Oesophageal gizzard present. Intestinal gizzard absent | MEGASCOLEX |
| 9 | Caudal nephridia with numerous funnels on each side on the anterior face of each septum. Bladders absent | OREOSCOLEX |
| - | Caudal nephridia with at most a single funnel on each side on the anterior face of each septum. Bladders often present | CRYPTODRILUS |

Subfamily ACANTHODRILINAE

Tribe ACANTHODRILINI s. Jamieson, 1971a

Genus **RHODODRILUS** Beddard, 1889

DIAGNOSIS. Setae 8 per segment. Prostatic pores 1 pair, on XVII (in one species on XVI) ; male pores combined with the prostatic pores or 1 pair, usually on XVII

close to them, sometimes anterior on XVIII, occasionally associated with the posterior ends of seminal grooves. Female pores 1 pair, on XIV. Spermathecal pores 1-5 pairs, the last pair anterior to 9/10. Nephropores in a single series on each side. Last hearts in XII or XIII. Gizzard single, occupying 1 or 2 segments in the region of V-VIII, usually strongly developed, occasionally small. Holonephric throughout or exceptionally with anterior meronephridia. Nephridial vesicles of various forms or absent. Calciferous glands present or absent. Holandric; gymnorchous. Prostates tubular; penial setae usually present. Spermathecae diverticulate.

TYPE-SPECIES. *Rhododrilus minutus* Beddard, 1889.

DISTRIBUTION. New Zealand and neighbouring islands. Two species in Australia: one in Queensland, the other in Tasmania.

TASMANIAN SPECIES. *Rhododrilus littoralis* sp. n.

REMARKS. The above generic definition is derived from that of Jamieson (1971b). In the latter work attention was drawn to the unsatisfactory distinction between *Rhododrilus* and *Microscolex*. Although the majority of species of *Microscolex* differ from *Rhododrilus* in having two pairs of prostates, the type-species, *M. phosphoreus* (Dugès), like *M. dubius* (Fletcher), has a single pair of prostates, as in *Rhododrilus*, and has been shown by Lee (1970) to have strong phenetic affinities with the latter genus (including the type-species, *R. minutus*) over which it has chronological priority. It is possible that *Rhododrilus* will have to be synonymized with *Microscolex* and new genera erected for some of the species of the present *Microscolex-Rhododrilus* complex which fall outside a redefined *Microscolex*. The following new Tasmanian species is provisionally placed in *Rhododrilus* because, like some other species of this genus, including the type-species, it lacks nephridial bladders whereas these are invariably present in *Microscolex*. In location of nephropores shortly below *c* lines it resembles *Microscolex dubius*, however, and differs from *Rhododrilus* in which nephropores are in *b* or *c*.

Rhododrilus littoralis sp. n.

Fig. 4, 26C, 32E; Plate 60. Table 1

l = 65, 74 mm, w = 2 mm, s = 103, 105.

Setal annuli strongly protuberant, excepting the anterior preclitellar and extreme caudal regions, and demarcated posteriorly by a groove equalling the intersegmental furrows in distinctness. Prostomium epilobous $\frac{2}{3}$, $\frac{1}{2}$, open, margins posteriorly convergent but indistinct. Dorsal pores weakly developed behind the clitellum, possibly present as rudiments in the immediate preclitellar segments. Setae 8 per segment, commencing on II, in regular longitudinal lines throughout; setae *a* and *b* absent (replaced by penial setae) in XVII. Nephropores not externally visible. Clitellum externally indistinct, annular, $\frac{1}{3}$ XIII- $\frac{1}{2}$ XVIII (= $5\frac{1}{6}$ segments) from dorsal incision (holotype); weakly developed but limits indeterminable in paratype 1. Male pores in XVII, in *b* on small whitish papillae which fill *ab* transversely and

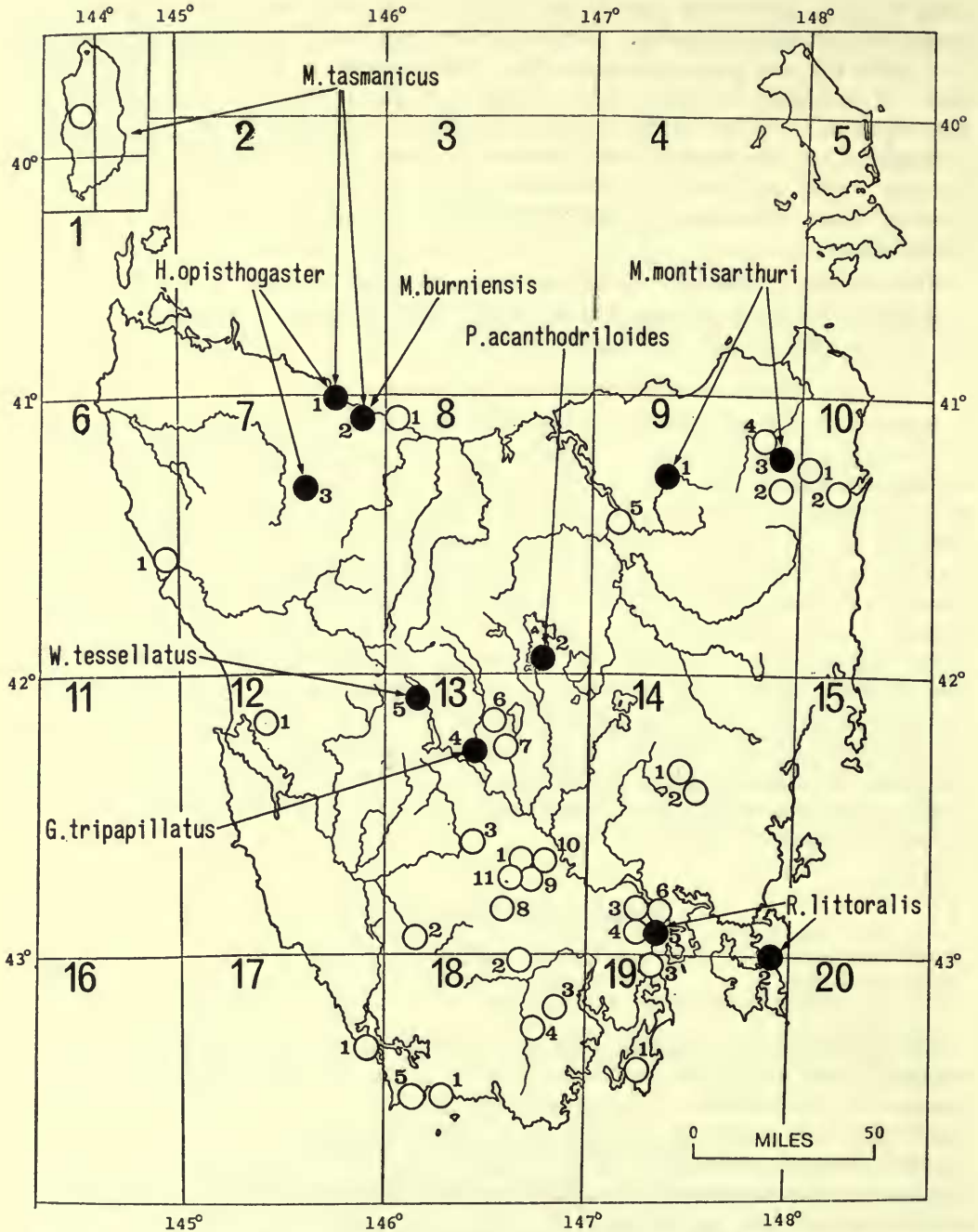


FIG. 4. Records of Tasmanian megascolecid earthworms excluding *Perionychella*, *Cryptodrilus* and *Oreoscolex* species. ●, present; ○, absent. (Numerals pertain to map references in text.)

occupy the posterior two-thirds of the segment. Accessory genital marking a transverse pad in 19/20, extending laterally shortly beyond *b* lines, and longitudinally abutting on the setal annuli of XIX and XX; strongly tumid and transversely bisected by a furrow corresponding with but not peripherally continuous with intersegmental furrow 19/20 (holotype); genital marking not certainly detectable in paratype 1. Female pores a pair on XIV, midway between the setal arc and anterior margin, very slightly lateral of *a* lines (paratype 1); not certainly demonstrable but apparently concealed in the anterior furrow delimiting the setal annulus in holotype. Spermathecal pores minute, concealed (holotype) or visible with difficulty (paratype 1) in intersegments 7/8 and 8/9, in *b* lines.

TABLE I

Intersetal distances in segment XII in *Rhododrilus littoralis*

| | mm | | | | | | | |
|---------------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 0.7 | 0.4 | 0.9 | 0.8 | 1.8 | 0.9 | 0.8 | 0.4 |
| paratype 1 | 0.8 | 0.5 | 0.9 | 0.8 | 1.8 | 0.8 | 0.9 | 0.5 |
| | standardized ($n = 100$) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 10.00 | 5.79 | 13.16 | 12.63 | 27.36 | 13.16 | 12.11 | 5.79 |
| paratype 1 | 11.22 | 6.63 | 13.27 | 11.73 | 26.02 | 11.22 | 12.76 | 7.14 |
| mean | 10.61 | 6.21 | 13.22 | 12.18 | 26.69 | 12.19 | 12.44 | 6.47 |
| interval/ <i>ab</i> | 1.71 | 1.00 | 2.13 | 1.96 | 4.30 | 1.96 | 2.00 | 1.04 |

Last hearts in XIII (those in X–XIII latero-oesophageal; with connectives to the dorsal and supra-oesophageal vessel). Supra-oesophageal vessel in VIII?–XIV; moderately developed. Gizzard small and easily compressible, though muscular, in V (holotype); rudimentary in paratype 1. Oesophagus lacking calciferous glands; especially vascularized and with low internal rugae in VIII–XVI; slender and less vascular in XVII and XVIII; intestine commencing, with dilatation, in XIX? (holotype, paratype 1); the alimentary canal in XVII and XVIII possibly intestinal, however; typhlosole absent. Nephridia stomate holonephridia, commencing in II, preseptal funnel (demonstrated in intestinal region) large, in *b* line; avesculate duct entering parietes one-third *bc* below *c*. Holandric; gymnorchous; testes large, much branched; sperm funnels small, faintly iridescent; seminal vesicles racemose, in IX, XI and XII increasing in size posteriorly. Metagynous (ovaries with many egg-strings); ovisacs present (paratype 1); not detectable in holotype. Prostates one pair, very slenderly tubular, in XVII–XXIII (holotype)–XXIV (paratype 1); vas deferens joining the muscular duct well ectal of the gland. Penisetal follicles conspicuous, as wide as the prostates and almost as extensive, extending from XVII–XXII. Penial setae filiform, sinuous; the ectal extremity depressed spatulate; ornamentation absent; length = 2.8–3.7 mm, general width of shaft = 11 μ m (paratype 1). Spermathecae 3 pairs, in VII, VIII and IX, each with ovoid ampulla and shorter digitiform (uninseminated) diverticulum on the

short, poorly demarcated duct; the spermatheca and diverticulum almost sessile on the body wall.

Genital markings. Of 13 paratypes, 11 have the genital field described for the holotype, with a single accessory genital marking, sometimes only faintly indicated, at 19/20; 2 lack the marking but are less mature than the others.

MATERIAL EXAMINED.

Eagle Hawk Neck, in kelp on rocks, 147°55'E. 43°00'S. Map. 19/2, Dr J. L. Hickman, Apr 1956 - holotype TM: K396; paratypes 1 and 4 BM(NH): 1973.2.53-54; paratypes 2 and 8 BJ: T77-78; paratypes 3, 5-7 TM: K397-400. Hobart, and 'Straham' [possibly Strahan, west coast of Tasmania?] 147°20'E. 42°50'S. Map, 14/5 collector? AM: G2628 - paratypes 9-13, AM: W5339-5343.

REMARKS. *R. littoralis* differs from all other species of the genus in the configuration of the male genital field. The other Australian species, *R. queenslandica*, differs among other respects in having only one pair of spermathecae.

Subfamily MEGASCOLECINAE

Tribe PERIONYCHINI Jamieson, 1971a

Genus *PERIONYCHELLA* Michaelsen, 1907a emend.

DIAGNOSIS. Setae 8 or more per segment. Combined pores of vasa deferentia and tubular or tubuloracemose prostates on XVIII. Gizzard in V, rarely VI or VII (well developed to vestigial); typhlosole absent. Extramural calciferous glands usually absent, and never paired, but the oesophagus often vascularized and internally rugose, especially in XIV and XV. Nephridia stomate, exonephric holonephridia with or without bladders; the anterior nephridia sometimes tufted. Spermathecae 1 to 5 pairs.

DESCRIPTION. Terrestrial or rarely aquatic worms. Form circular in cross section or depressed; anus terminal; with or without pigmentation. Dorsal pores present or absent, usually commencing in 3/4 or 4/5. Setae 8 per segment throughout (lumbricine condition) or becoming more numerous (perichaetine condition) after a varying number of anterior segments, or perichaetine throughout. Nephropores in a single series throughout in the vicinity of *c* lines (where setae are lumbricine) or their equivalent in perichaetine species. Posterior limit of clitellum shortly anterior to the male pores or (*P. (P.) canaliculatus* and *phalacrus*) including these. A pair of pores of the combined vasa deferentia and a pair of tubular, tubuloracemose or racemose prostates on XVIII. Female pores paired or exceptionally single mid-ventral, in XIV. Spermathecal pores 1 to (usually) 5 pairs in front of or usually including intersegment 8/9. Accessory genital markings present in the vicinity of the male pores and sometimes of the spermathecal pores.

Last hearts in XII or (*P. (V.) grandis*) XIII. Supra-oesophageal vessel (always?) restricted to the post-gizzard oesophagus, moderately to well developed, sometimes not differentiated from the oesophageal plexus. Subneural vessel absent. Gizzard in V or exceptionally in VI, frequently only moderately developed or vestigial (in

some northern Queensland species in VII). Oesophagus commonly with internal rugae, these often best developed in XIV and XV ; sometimes with internal laminae which exceptionally line one or more annular, unpaired, axial calciferous glands. Intestine commencing in XVI-XX, usually XVII ; typhlosole, muscular thickening and caeca absent or exceptionally, a rudimentary typhlosole-like dorsal ridge present. Nephridia simple, exonephric holonephridia throughout, or rarely preceded in anterior segments by tufted nephridia with simple or (*P. (P.) davallia*) composite ducts. Ectal nephridial bladders present (*Vesiculodrilus*) or absent (*Perionychella*) ; tufted nephridia retaining bladders in vesiculate species. Holandric (testes in X and XI), with seminal vesicles in IX and XII or rarely also in X, or X and XI, or in XI and XII ; or rarely metandric, with anterior testes and seminal vesicles reduced or absent. Metagynous (ovaries in XIII) ; ovisacs present or absent. Prostates tubular, with central lumen, though often flattened, or tubuloracemose (i.e. lobulated to externally racemose but with axial lumen with (or without ?) side branches). Vasa deferentia usually joining the ectal end of the prostate gland, occasionally the junction of gland and duct. Penial setae usually present. Spermathecae with single, clavate or digitiform, uniloculate diverticulum.

DISTRIBUTION. Eastern Subregion of Australia : mostly in Victoria but extending northwards to the Atherton Tableland in North Queensland and with a morphologically isolated species near Cooktown. The dominant genus in Tasmania.

REMARKS. The genus *Perionychella* was established by Michaelsen (1907a) for four eastern Australian species : *Perichaeta dendyi* Spencer, 1892b, and *Megascolex pritchardi* Spencer, 1900, both from Victoria ; *Perichaeta canaliculata* Fletcher, 1888a, from north Queensland ; and *P. scolecoidea* Spencer, 1895, from Tasmania. Michaelsen's diagnosis of *Perionychella* was : setae at least in the mid- and hind-body many (more than 8) per segment. Spermathecal pores 2-4 (-5 ?) pairs between segments IV and IX. 1 gizzard, in segment 5 or 6. Completely meganephric (holonephric). Prostates with branched canal system.

The only expressed difference from the typically southwestern Australian *Woodwardia* (now *Woodwardiella* Stephenson, 1925) was the increase in setal numbers beyond 8 per segment. The status of *Woodwardiella* is discussed on p. 219.

In 1916 Michaelsen emended the definition of the genus *Perionyx* Perrier, 1872, to agree in all essentials with that of *Perionychella*, which was therefore suppressed, and included *Diporochoeta* Beddard in *Perionyx* as a subgenus. The subgenus *Perionyx* was distinguished by branching of the prostate duct on entering the gland (*Pheretima* prostate) while in *Diporochoeta* the gland possessed a central axial lumen with or without branched or unbranched lateral canals. *Perionychella dendyi* (like *P. canaliculata*) was shown to have the *Diporochoeta* condition, with lateral canals, and was placed in that subgenus. Stephenson (1923) reinstated *Diporochoeta* as a separate genus while suggesting a close relationship with *Perionyx*. *Perionychella* remained suppressed in *Diporochoeta*. Gates (1959) placed *Diporochoeta* and *Perionyx* in different families, the redefined Acanthodrilidae and Megascolecidae respectively. Jamieson (1971a) demonstrated that the grounds for distinguishing the two families were invalid and, having redefined and reconstituted the two entities, reduced them

to subfamilial rank in the Megascolecidae. Restriction of *Perionyx* to oriental species (Gates, 1960) was accepted and 40 Australian species were provisionally referred to the genus *Diporochoeta*. It was suggested that revision of *Diporochoeta* required consideration of certain species placed in *Plutellus* which were distinguished solely by the numbers of setae and that it would necessitate establishment of several new genera. It was also proposed that *Perionychella* should be resurrected for *Perichaeta dendyi* as it was clearly not congeneric with the New Zealand type-species of *Diporochoeta* (see p. 219). Relationship of *Perionyx* and *Diporochoeta* s. lat. was acknowledged by placing the two genera, with other holonephric megascolecine genera, in the new tribe Perionychini.

Revision of *Plutellus* is now far advanced and has involved resurrection of *Argilophilus* Eisen for American species, and division of the Australian species, after reinstatement of *Fletcherodrilus* Michaelsen, into the genera *Plutellus* s. strict., *Simsia* Jamieson, 1972a; *Graliophilus* Jamieson, 1971e, and *Vesiculodrilus* Jamieson, 1973a. In the latter paper attention was drawn to the close morphological affinity of *Vesiculodrilus* with similarly vesiculate Australian species of *Diporochoeta* s. lat.

The Tasmanian fauna provides the key to revision of *Diporochoeta* in Australia, and to the relationships of *Vesiculodrilus*, as vesiculate perichaetine species which would formerly have been assignable to *Diporochoeta* s. Stephenson are seen to have morphological (phenetic) affinities, which are unequivocally intrageneric, with species attributable to *Vesiculodrilus*. Transference of these perichaetine species to *Vesiculodrilus* greatly reduces the numbers of species in *Diporochoeta* but leaves a large residue of species either lacking nephridial bladders (avesiculate species) or with the condition of the nephridial duct undescribed. The Tasmanian fauna, again, allows determination of the affinities of the avesiculate species as most of these on the island show high morphological similarities with *Vesiculodrilus*. They are also indistinguishable from *Perionychella*, of which the Victorian type-species is avesiculate. (Variation in form of the prostates from tubular to racemose is considered unimportant as all intermediates are seen, author's examination.) It thus appears that *Vesiculodrilus* must be included in *Perionychella*, a prior genus which has been suppressed for nearly sixty years.

It is here proposed that *Vesiculodrilus* be retained as a subgenus of *Perionychella* distinguished from the nominate subgenus (*P. (Perionychella)*) in possessing nephridial vesicles. It is possible that some species of *Vesiculodrilus* may be morphologically closer to avesiculate *Perionychella* species than to species in their own subgenus (and *vice versa*), but recognition of the two subgenera achieves one of the aims of practical taxonomy, convenience. Separation of *Vesiculodrilus* from *Perionychella* also finds some support in setal ratios (Table 1) though whether the distinction by ratios will be upheld should additional lumbricine species of the latter subgenus be found remains to be seen. Thus, for Tasmanian species at least, $dd = 2.0-3.1ab, 0.18-0.22u$ in *Vesiculodrilus* (with the exception of the morphologically very isolated *P. (V.) glandifera* in which $dd = 5.6ab, 0.27u$) while in the two lumbricine species of *Perionychella* $dd = 6.5-7.8ab, 0.33-0.39u$. Furthermore, while recognition of *Vesiculodrilus* species presents little difficulty, there may be some difficulty in ascertaining whether an avesiculate specimen should be referred to the subgenus *Perionychella* or to other

similarly holonephric genera (particularly the Western Australia avesciculate *Graliophilus*) or merits recognition of a new genus. (It should be noted that the difficulty in distinguishing between avesciculate *Perionychella* species and *Graliophilus* stems largely from paucity of knowledge of some species-groups of *Graliophilus* and that it is not proposed that *Graliophilus* should be united with *Perionychella*. Rather, as suggested by Jamieson (1971e), *Graliophilus* requires splitting into further genera.) Reinstatement of *Perionychella* is necessitated by the rules of priority but Michaelsen's definition of *Perionychella* does not diagnose the majority of species of the genus as emended and enlarged on the basis of consideration of large numbers of characters, i.e. overall phenetic resemblance of constituent species, and an emended definition is therefore required. It will be shown that the only characters which are constant throughout the emended genus are general characters of suprageneric, often ordinal or subordinal significance. The genus is thus polythetic, that is to say characters of generic significance are not present in all constituent species but jointly associate these species at a high level of similarity. Furthermore, several generic characters, such as nephridial bladders and five pairs of spermathecae, are constant for the majority of species and give striking morphological homogeneity to these species which can often only be distinguished with certainty by the configuration of genital markings.

Something more must be said of the status of *Woodwardiella* and of *Diporochaeta*. The fact that in the present work *Perionychella* has been extended to include forms with eight setae per segment removes all justification for separating *Woodwardiella* as defined by Michaelsen from this genus. However, the Western Australian species, including the type-species, of *Woodwardiella* invariably have two pairs of spermathecae and are characterized by anterior tufted nephridia. These conditions do occur exceptionally in *Perionychella* but it seems inadvisable at present to reduce *Woodwardiella* to the status of a junior synonym in the former. The refractory state of material of *Woodwardiella* in the Western Australian Museum (Jamieson 1970) precludes thorough revision of the genus. The status of these Eastern Australian species tentatively assigned, from poor descriptions, to *Woodwardiella* requires mention. One of these, *Cryptodrilus mortoni* Spencer, 1895, is shown to be a *Perionychella* (*Vesiculodrilus*) in the present work. A second *C. tessellatus* Spencer, 1895, is almost certainly also a *Perionychella*. It has not been rediscovered in this survey. The third, *Woodwardia healesi* Michaelsen, 1923, cannot be placed with certainty in any known genus.

The type-species of *Diporochaeta*, *D. intermedia* Beddard, 1888, is exceptional in the Megascolecinae in having its last hearts in segment XI rather than in XII or XIII. This seems a normal condition in the species as it has been observed in material from several localities (Lee 1959). The fact that the ovaries are in the normal megadrile location in XIII and that spermathecae may persist in IX indicates that the unusual distribution of hearts and spermathecae is not simply due to deletion of a prespermathecal metamere. Loss of hearts from XII would be contrary to evolutionary trends in the Megascolecinae. If last hearts were in XII, *D. intermedia* might be considered congeneric with the extended *Perionychella* of the present work and, as *Diporochaeta* is the prior genus, all *Perionychella* species would have to be

placed in it. Other *Diporochoaeta* species in New Zealand appear from the literature to qualify for inclusion in *Perionychella* s. lat. but must be re-examined before this can be confirmed. It is here proposed to retain *Perionychella* for Australian forms conforming with the Australian type-species *Perionychella dendyi*, and to allow the heart-location in *Diporochoaeta intermedia* to merit regarding this species as constituting a monotypic genus *Diporochoaeta*. This restriction of *Diporochoaeta* will not, however, be formally made until the status of the other New Zealand species currently in *Diporochoaeta* is decided, when they may be referred to *Perionychella* or considered to warrant one or more genera distinct from both *Perionychella* and a monotypic *Diporochoaeta*.

Perionychella accounts for almost half of the native Tasmanian earthworm species. The very profound emendation of the genus after a long period of suppression makes it desirable to list those non-Tasmanian species assignable to the genus and it will be seen that these comprise substantial components of the fauna of neighbouring Victoria.

Subgenus **PERIONYCHELLA** Michaelsen, 1907a emend.

DEFINITION. As for the genus with nephridia lacking bladders.

DISTRIBUTION. As for the genus but the generic identity of the Queensland species is uncertain.

TYPE-SPECIES. *Perionychella dendyi* (Spencer, 1892b) Victoria. Syntype (?) examined, AM : W.1294.

CHECK LIST

Tasmanian species

P. (P.) capensis sp. n.

P. (P.) hickmani sp. n.

P. (P.) kershawi sp. n.

**Perichaeta irregularis* Spencer, 1895

P. (P.) weldboroughi sp. n.

Other species

Unless otherwise stated, material has been examined by the author as indicated.

Victoria

**Perichaeta copelandi* Spencer, 1892b Lectotype NMV : G186 ; paralectotype G1443

**Diporochoaeta davallia* Spencer, 1900, *vide* Jamieson (1970)

**Perichaeta dubia* Spencer, 1892b Syntype (?) AM : W1293

Megascolex pritchardi Spencer, 1900, *vide* Michaelsen (1907a) and lectotype NMV : G108

**Perichaeta tanjilensis* Spencer, 1892b Syntype (?) AM : W1298

New South Wales

None known

Queensland

- **Perionyx (Diporochaeta) athertonensis* Michaelsen, 1916
Perichaeta canaliculata Fletcher, 1888a, *vide* Michaelsen (1907b)
 **Perionyx (Diporochaeta) erici* Michaelsen, 1916
 **Perionyx (Diporochaeta) phalacrus* Michaelsen, 1916
 **Perionyx (?) terrareginae* Fletcher, 1889b

* Comb. nov.

REMARKS. The condition of the nephridial ducts is not described for the Queensland species but they presumably lacked bladders as all were described by Michaelsen (1916) who in the same account described nephridial bladders for a further *Perionyx* species (*P. (D.) sigillatus*). The types are not available for examination. That these species, from the Cairns–Atherton Tableland area, should be referred to the genus *Perionychella* is nevertheless questionable. The gizzard is located more posteriorly than in Victorian and Tasmanian species, the number of setae per segment is more numerous and, although it is deduced that nephridial bladders are absent, they show affinities with *Perionyx (Diporochaeta) sigillatus* Michaelsen, 1916, from the same area, which has bladders and appears to be related to the similarly vesiculate genus *Fletcherodrilus*, rather than with *Perionychella*. Exclusion of the five north Queensland species from *Perionyx* as emended by Gates (1960) is necessitated by a set of characters of the latter genus, *viz.* female pore unpaired, midventral; sub-neural vessel present; spermathecal diverticula absent.

Subgenus **VESICULODRILUS** Jamieson, 1973a

DEFINITION. As for the genus with nephridia possessing ectal bladders. (One morph of *P. (V.) mortoni* lacks bladders and their presence is questionable in the type-specimens of *P. (V.) lacustris*.)

DISTRIBUTION. As for the genus.

TYPE-SPECIES. *Cryptodrilus frenchi* Spencer, 1892a. Victoria.

CHECK LIST

Tasmanian species

- P. (V.) bithecata* sp. n.
 **Perichaeta dilwynnia* Spencer, 1895
P. (V.) evansi sp. n.
P. (V.) glandifera sp. n.
P. (V.) hellyeri sp. n.
Cryptodrilus hobartensis Spencer, 1895 (new synonym *C. insularis* Spencer, 1895)
 **Perionyx lacustris* Stephenson, 1924
P. (V.) montisarthuri sp. n.
 **Cryptodrilus mortoni* Spencer, 1895
P. (V.) obliquae sp. n.
P. (V.) pedderensis sp. n.
P. (V.) tunnackensis sp. n.

* Comb. nov.

Other species

Unless otherwise stated, material has been examined by the author as indicated.

Victoria

**Perichaeta alsophila* Spencer, 1892b Syntype (?) AM : W1297

**Diporochoeta arnoldi* Spencer, 1900 Lectotype NMV : G203

**Diporochoeta euzona* Spencer, 1900 Lectotype NMV : G120

Cryptodrilus frenchi Spencer, 1892a, *vide* Jamieson (1973a)

**Diporochoeta frosti* Spencer, 1900 Lectotype NMV : G117

Cryptodrilus gippslandicus Spencer, 1892a, *vide* Jamieson (1970)

**Perichaeta lochensis* Spencer, 1892a, *q.v.*

**Diporochoeta manni* Spencer, 1900 Lectotype NMV : G118

**Diporochoeta mediocincta* Spencer, 1900 Lectotype NMV : G124

**Diporochoeta richardi* Spencer, 1900 Lectotype NMV : G220

Cryptodrilus tanjilensis Spencer, 1892a, *vide* Jamieson (1973a) and paralectotype
NMV : G55

Megascolides tisdalli Spencer, 1900, *vide* Jamieson (1972) and lectotype NMV : G178

Plutellus uncinatus Stephenson, 1933, *q.v.*

Cryptodrilus victoriae Spencer, 1892a, *vide* Jamieson (1973a) and paralectotype
NMV : G1410

Megascolides volvens Spencer, 1900, *vide* Jamieson (1973a) and syntype (?)
AM : W1292

**Cryptodrilus willsiensis* Spencer, 1892a Syntype (?) AM : W1279

New South Wales

Vesiculodrilus frenchi (Spencer), *vide* Jamieson (1973a)

**Diporochoeta pheretima* Jamieson, 1973a

Vesiculodrilus purpureus Jamieson, 1973a

Queensland

**Perichaeta barronensis* Fletcher, 1887b Syntypes (?) AM : W2387

**Diporochoeta grandis* Spencer, 1900 Lectotype NMV : G184

Perionychella species of uncertain subgeneric status

The following species which are not available for re-examination accord with the above-emended definition of the genus *Perionychella* but are of uncertain subgeneric status as their authors did not record presence or absence of nephridial bladders. They are known customarily to have omitted reference to these in accounts of species since shown to possess bladders. All except *Perionychella scolecooides* (Spencer, 1895) are new combinations in *Perionychella*.

Tasmania

Megascolides bassanus Spencer, 1895 (King Island)

Plutellus decatheca Michaelsen, 1910

Cryptodrilus ellisi Spencer, 1895

Tasmania (cont.)

Perichaeta moroea Spencer, 1895*Perichaeta richae* Spencer, 1895 (this supposedly has gizzards in III and IV, a most doubtful observation)*Perichaeta scolecoidea* Spencer, 1895

Victoria

Diporochaeta apiocystis Stephenson, 1933*Perichaeta bakeri* Fletcher, 1888b*Perichaeta dicksonia* Spencer, 1892b*Diporochaeta faucium* Michaelsen, 1907b*Diporochaeta lindti* Spencer, 1900*Diporochaeta nemoralis* Spencer, 1900*Perichaeta obscura* Spencer, 1892b*Diporochaeta sedecimalis* Michaelsen, 1907b*Diporochaeta spenceri* Michaelsen, 1907b*Diporochaeta telopea* Spencer, 1900*Perichaeta walhallae* Spencer, 1892b

New South Wales and Queensland

No additional species

KEY TO TASMANIAN SUBGENERA AND SPECIES OF *PERIONYCHELLA*

For species of uncertain subgeneric status see specific descriptions (p. 253 et seq.).

- | | | |
|---|---|--|
| 1 | Nephridial bladders absent | subgenus <i>PERIONYCHELLA</i> , 2 |
| - | Nephridial bladders present | subgenus <i>VESICULODRILUS</i> , 6 |
| 2 | Setae 8 per segment throughout.* | Accessory genital markings unpaired midventral |
| | or paired medianly contiguous respectively in 17/18 and 18/19. Fig. 7A | |
| | | <i>P. (P.) weldboroughi</i> sp. n. |
| - | Setae more than 8 per segment throughout or behind the clitellum. Postclitellar genital markings not median. | 3 |
| 3 | Setae 8 per segment anteriorly; numerous posteriorly. Fig. 5B | <i>P. (P.) kershawi</i> sp. n. |
| - | Setae more than 8 per segment throughout | 4 |
| 4 | Spermathecae 2 pairs. Fig. 5A | <i>P. (P.) capensis</i> sp. n. |
| - | Spermathecae 3-5 pairs | 5 |
| 5 | Spermathecae 3 pairs.† Fig. 6C | <i>P. (P.) irregularis</i> (Spencer, 1895) |
| - | Spermathecae 5 pairs. Fig. 6A, B | <i>P. (P.) hickmanni</i> sp. n. |
| 6 | Setae 8 per segment throughout | 7 |
| - | Setae more than 8 per segment throughout or at least caudally | 13 |
| 7 | Spermathecal pores 5 pairs | 8 |
| - | Spermathecal pores less than 5 pairs | 10 |
| 8 | Dorsal blood vessel bifid in the oesophageal region. A median oesophageal gland in XV. Seminal vesicles in XI and XII. Pericardiac testis-sacs present. Fig. 10A, B | <i>P. (V.) glandifera</i> sp. n. |

* An avesculate morph of *P. (V.) mortoni* keys out here but differs from *weldboroughi* in having a genital field much as Fig. 12B.† Typical specimens of *P. (V.) lacustris* with rudimentary or no bladders key out here but differ from *irregularis* in having a genital field as in Fig. 7B.

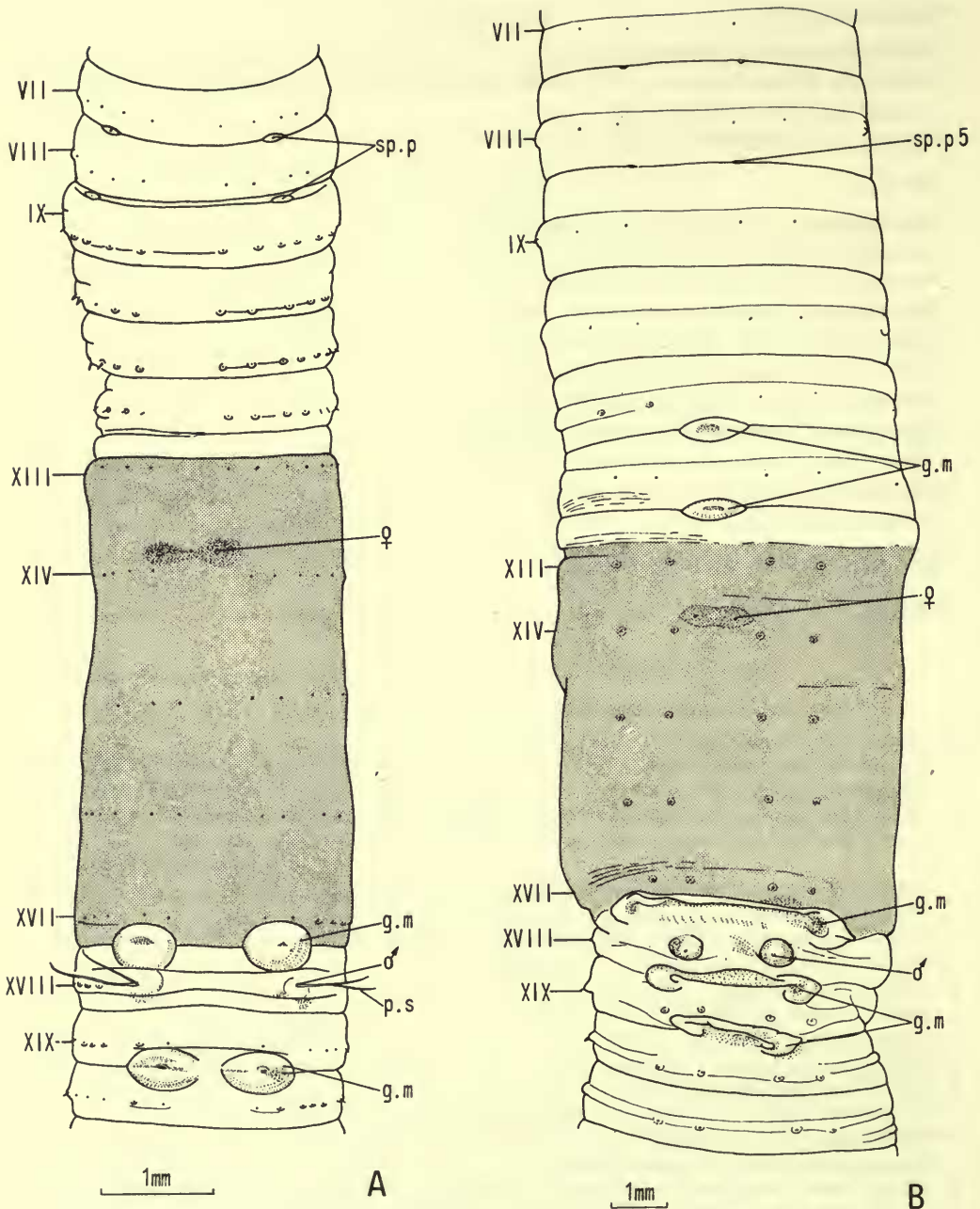


FIG. 5. Genital fields. A, *Perionychella (P.) capensis*, holotype. B, *P. (P.) kershawi*, holotype.

Abbreviations used in figures 5-32. ♀, female pore; g.m, accessory genital marking; ♂, male pore; p.s, penial seta; sp.p., spermathecal pore. Roman numerals indicate respective segments. Clitellum shaded. All figures by camera lucida.

- Dorsal blood vessel single. No extramural oesophageal glands present in XV though internal rugae may be present here and elsewhere. Seminal vesicles in IX and XII. Testis-sacs absent 9
- 9 Paired accessory genital markings of the male field at the posterior borders of their segments but not intersegmental. Fig. 12B *P. (V.) mortoni* Spencer, 1895)
- Paired accessory genital markings of the male field intersegmental. Fig. 11 *P. (V.) hobartensis* (Spencer, 1895), part
- 10 Spermathecal pores 1 pair. Fig. 8A *P. (V.) bithecata* sp. n.
- Spermathecal pores 2 to 4 pairs 11
- 11 Spermathecal pores 2 pairs. Fig. 9A *P. (V.) evansi* sp. n.
- Spermathecal pores 3 or 4 pairs 12
- 12 Spermathecal pores 3 pairs. Fig. 14 *P. (V.) tunnackensis* sp. n.
- Spermathecal pores 4 pairs. Fig. 11 *P. (V.) hobartensis* (Spencer, 1895), part
- 13 Setae 8 per segment in some anterior segments ; numerous posteriorly. Spermathecal pores 3 pairs 14
- Setae more than 8 per segment throughout. Spermathecal pores 3-5 pairs 15
- 14 Genital markings present in *aa* in XVII and XVIII. Fig. 9B. *P. (V.) hellyeri* sp. n.
- Genital markings absent in *aa*. Fig. 12A *P. (V.) montisarthuri* sp. n.
- 15 Spermathecal pores 5 pairs 16
- Spermathecal pores 4 pairs or less 17
- 16 Accessory genital markings including a midventral unpaired papilla posteriorly in each of VI and VII and anteriorly in XVIII. Fig. 8B *P. (V.) dilwynnia* (Spencer, 1895)
- Accessory genital markings may include a midventral papilla in VII but not elsewhere. Fig. 13A, B *P. (V.) obliquae* sp. n.
- 17 Spermathecal pores 3 pairs. Dorsal pores present. Fig. 7B *P. (V.) lacustris* (Stephenson, 1924)
- Spermathecal pores 4 pairs. Dorsal pores absent. Fig. 12C *P. (V.) pedderensis* sp. n.

Perionychella (Perionychella) capensis sp. n.

Fig. 1, 5A, 16A, B ; Plates 91 and 92

l = 50 mm, w = 2.4, 2.5 mm, s = 108 (holotype ; paratype 1 is a posterior amputee).

Prostomium epilobous $\frac{2}{3}$ or proepilobous. First dorsal pore 5/6. Setae in XII 22, 24 ; caudally 31, 29 or more in some segments ; ventral gap (*aa*), approximately constant, $\div 2-3ab$ throughout ; dorsal gap (*zz*) $\div 1-2yz$, narrowing posteriorly but still distinct. Nephropores : preclitellar (XIII) in setal lines 6 ; intestinal in s.l. 8. Clitellum annular $\frac{1}{2}$ XIII-XVII. Male pores on XVIII on *b*, each with a pair of protruding, very long penial setae, on dome-shaped papillae extending from *a* to slightly median of *c*. Paired eye-like genital markings from s.l. 1 to s.l. 3 at 17/18 and from median to s.l. 1 to s.l. 2 at 19/20, that in 19/20 present on the left side only in paratype 1. Female pores paired anterior and slightly median of *a* on XIV. Spermathecal pores 2 pairs on small papillae in s.l. 3 at 7/8 and 8/9.

Last hearts in XII (latero-oesophageal). Supra-oesophageal in VIII-XIII, well developed. Gizzard vestigial, in V, an equally large but thinner walled proventriculus in IV. Extramural calciferous glands absent but oesophagus with circumferential vascular striae in VII-XV, especially dilated in XIV and XV in which, however, longitudinal rugae remain few and low. Intestinal origin $\frac{1}{2}$ XVI ; a very low dorsal typhlosole present (hardly appreciable).

Nephridia : simple stomate, avesiculate, exonephric holonephridia ; commencing segment indeterminate ; preseptal funnels demonstrated for those of XV posteriorly. Holandric (funnels iridescent in X and XI) ; gymnorchous ; seminal vesicles racemose, in IX and XII. Metagynous ; ovisacs present (paratype 1) or not developed (holotype). Prostates tubuloracemose, in XVIII, elongate, tongue-shaped, deeply incised, almost sessile as the duct is short ; a narrow central lumen present in the gland. Penial setae (holotype) filiform and strongly sinuous ; ectal end in profile with a group of a few small anteriorly directed spines repeated at intervals longitudinally ; tip with long, horn-shaped projections in two sequential sets of two, slightly below the pointed, asymmetrical extremity, and probably homologous with the spines ; length (right setae) 1.95, 2.74 mm. Spermathecae 2 pairs ; diverticulum (inseminated) single, digitiform, uniloculate, longer than the ampulla.

MATERIAL EXAMINED.

Table Cape, 145°45'E. 41°00'S. Map, 7/1, Dr J. L. Hickman, 24 Aug 1954 - holotype TM : K259 ; paratype 1 BM(NH) : 1972.8.3 ; paratype 2 BJ : T1.

REMARKS. *P. (P.) hickmani* is morphologically the closest species to *P. (P.) capensis* in the subgenus. Among other differences from *hickmani* are the two pairs of spermathecal pores and the genital markings in 19/20. It is also unique in the genus, in Tasmania, in possessing a typhlosole-like dorsal thickening of the intestinal wall (questionably to be considered a true typhlosole) and in location of the first dorsal pore in 5/6.

Perionychella (Perionychella) hickmani sp. n.

Fig. 1, 6A, B, 16C, D

l = 94, 75 mm, w = 4 mm, s = 125, 112.

Prostomium epilobous $\frac{3}{8}$, open. First dorsal pore 4/5 (rudiment in 3/4 in holotype?). Setae in XII 24, 21 ; caudally 31, 33 ; dorsal and ventral rows (*a* and *z*) straight throughout ; ventral gap approximately 3*ab* throughout ; dorsal gap approximately 1.5 or 2*yz* anterior to clitellum ; equal to *yz* caudally. Nephropores : preclitellar pores in setal lines 6-7 ; postclitellar in setal lines 7. Clitellum annular $\frac{1}{2}$ XIII- $\frac{1}{2}$ XVII, XVII. Males pores equatorial in XVIII in *ab-b*, on prominent papillae. Paired eye-like genital markings in 16/17, 17/18 and 18/19 in *ab*. Female pores paired on XIV, anterior and slightly median of *a*. Spermathecal pores 5 pairs, in 4/5-8/9, on small papillae in *ab*.

Last hearts in XII (latero-oesophageal). Supra-oesophageal in VIII-XIII, well developed. Gizzard large but compressible, in V. Oesophagus simple ; extramural calciferous glands absent. Intestinal origin XVIII (though pushing septum 17/18 forwards) ; typhlosole absent. Nephridia simple stomate, avesiculate, exonephric holonephridia commencing in II (preseptal funnel demonstrated in XIV but presumably present further anteriorly as nephridial morphology similar) ; tufts absent ;

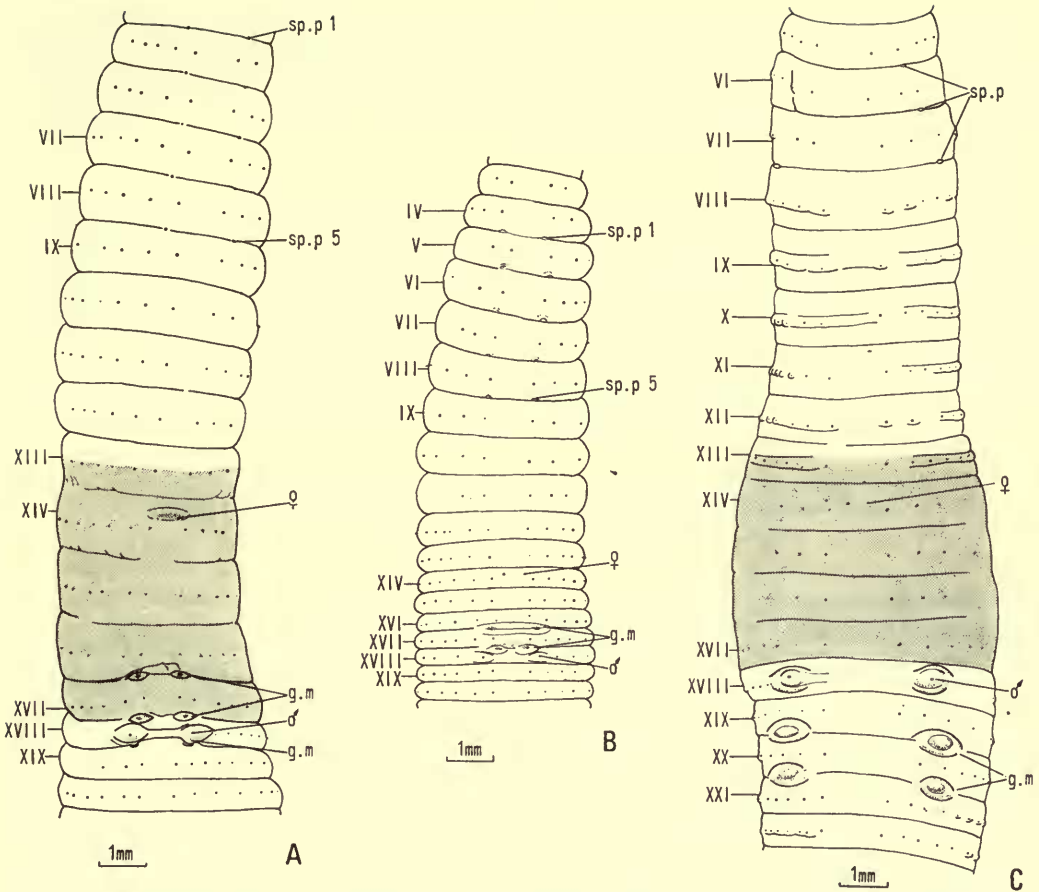


FIG. 6. Genital fields. A & B, *Perionychella (P.) hickmani*: A, holotype; B, paratype 3. C, *P. (P.) irregularis*, lectotype.

ducts tubular, seminal vesicles racemose, in IX and XII. Metagynous; ovisacs large, in XIV. Holandric (funnels iridescent in X and XI); gymnorchous. Prostates: gland almost circular, appearing to form a simple flattened lobe but resolvable into a zig-zag with narrow central lumen, the arms of which are expanded and not tubular (holotype) or depressed tubular, zig-zag in XVII-XIX (paratype 1); vas deferens joining ectal end of gland. Penial setae slender, almost filiform; tip rounded, possibly worn, and with no notable sculpturing (holotype, paratype 2) or with a delicate tip hooked through about sixty degrees (paratype 3); length (right setae), 0.96, 0.85 and 1.22 mm, respectively. Spermathecae 5 pairs; diverticulum single, clavate, uniloculate.

Genital markings. 7/3 - paratype 2 agreeing exactly with holotype and paratype 1; 13/5 - paratypes 3 and 4, mature specimens as holotype but lacking accessory genital markings in 18/19.

Other variation. The two mature paratypes from Lake St Clair agree closely in morphology with the holotype, differing in the following unimportant respects: $l = 47-49$ mm; $s = 105-108$; the prostomium is closed; the setal count rises to 46 caudally; the nephridia of II are astomate rudiments, those of III having demonstrable funnels (see also *Genital markings*).

MATERIAL EXAMINED.

Fern Glade, Emu River, Burnie, $145^{\circ}55'E. 41^{\circ}05'S.$ Map, 7/2, Dr J. L. Hickman, 24 Aug 1954 - holotype TM: K260. Hellyer Gorge, $145^{\circ}35'E. 41^{\circ}20'S.$ Map, 7/3, Dr J. L. Hickman, 28 May 1954 - paratype 1 BM(NH): 1972.8.12. Parrawe, $145^{\circ}35'E. 41^{\circ}20'S.$ Map, 7/3, Dr J. L. Hickman, 25 Aug 1954 - paratype 2 TM: K261. Lake St Clair, $146^{\circ}10'E. 42^{\circ}05'S.$ Map, 13/5, Dr J. W. Evans, Feb 1941 - paratypes 3 and 4 BM(NH): 1972.8.13-14; paratype 5 AM: W5185.

REMARKS. Differences between this species and *P. (P.) capensis*, which is closest to it morphologically, are given under the latter species.

***Perionychella (Perionychella) irregularis* (Spencer, 1895)**

Fig. 1, 6C

Perichaeta irregularis Spencer, 1895: 53-54, Pl. V, fig. 52-54.

Diporochoeta irregularis; Michaelsen, 1900: 206; Jamieson, 1971b: 83.

$l = 87$ mm, $w = 4.7$ mm, $s = 104$.

Prostomium canaliculate, epilobous $\frac{1}{2}$. First dorsal pore in 4/5. Setae 11 on each side in V, 15-16 on each side in XII and onto the midbody; 20 on each side caudally; ventral and dorsal setal gaps conspicuous throughout; in XII $aa \doteq 2ab$, $zz \doteq 3zy$; in the midbody and caudally $aa \doteq 3ab$, $zz \doteq 4zy$. Nephropores between setal lines 8 and 9. Clitellum annular, $\frac{1}{2}$ XIII-XVII and, dorsally, anterior XVIII; setae, intersegments (weaker) and dorsal pores retained. Male pores on prominent elliptical papillae between setal lines 2 and 3, nearer 2, on XVIII, the intervening setal rows not demonstrably bearing setae in this segment. Two pairs of eye-like accessory genital markings in (or, lectotype, immediately median to) setal lines 3, in 19/20 and 20/21. Female pores in XIV, anteromedian of *a*, near the ventral midline. Spermathecal pores 3 pairs, in 6/7, 7/8 and 8/9, in setal lines 3, 4 and 5 respectively (Spencer) but only slightly divergent posteriorly.

Dorsal blood vessel single, continuous onto the pharynx. Last hearts in XII (latero-oesophageal but lacking dorsal connectives). Supra-oesophageal weakly developed, in X-XII. Gizzard small, with pronounced muscular sheen but easily compressed, appearing to lie in VI but the very attenuated septum 5/6 adherent to it slightly behind its anterior limit, suggesting that the gizzard has moved from V into VI by adhesion of the attenuated septum. Calciferous glands absent but oesophagus vascularized in VIII-XVI and swollen in some of these. Intestinal origin XVII; typhlosole absent. Nephridia stomate avesiculate holonephridia, commencing in II (funnels demonstrated from XVIII); tufted nephridia absent. Holandric (funnels iridescent in X and XI); seminal vesicles 4 pairs, small and simple in IX and X, large and racemose in XI and XII. Metagenous; small ovisacs in XIV.

Prostates depressed, linear, laterally deeply incised, in XVII–XXII, resolvable with difficulty into a tubular form; external muscular duct very long and tortuous. Penial setae absent. Spermathecae 3 pairs, not notably departing from a line parallel with the body axis; diverticulum (inseminated) single, clavate, uniloculate.

TYPE-LOCALITY. King River Valley, approximately 145°25'E. 42°10'S. Map, 12/1.

MATERIAL EXAMINED.

The previously dissected lectotype, NMV: G288.

REMARKS. The above account considerably augments that of Spencer and demonstrates the avesculate condition of the nephridial ducts for the first time. The dimensions accord with the specimen described by Spencer.

Closest to this species are the similarly perichaetine species *P. (P.) hickmani* and *P. (P.) capensis*. It differs from both in having three pairs of spermathecal pores and in lacking genital markings anterior to the male pores.

Perionychella (Perionychella) kershawi sp. n.

Fig. 1, 5B, 16E. Table 2

l = 171 mm, w = 6.1 mm, s = 119.

Prostomium epilobous $\frac{1}{3}$, closed with a grooved peristomium giving a tanylobous appearance. First dorsal pore 4/5. Setae 8 per segment anterior to clitellum; posterior to clitellum occasionally with an extra seta in *cd*; in the posterior half, setae at first added in the dorsal gap, caudally the rows becoming irregular and approximately 21 seta per segment. Nephropores in *c* lines anteriorly; visible posteriorly but setal lines irregular. Clitellum annular, XIII–XVII. Male pores on small dome-shaped papillae in *a* on XVIII. Small eye-like unpaired midventral accessory genital markings in 11/12 and 12/13; paired transversely conjoined markings, extending lateral of mid *bc* at 17/18, extending shortly lateral of *b* at 18/19 and occupying *bb* at 19/20. Female pores a pair in XIV, anteromedian of *a*. Spermathecal pores 5 pairs in 4/5–8/9, on small papillae in *a*.

Last hearts in XII, latero-oesophageal, connectives to dorsal vessels very slender, thread-like. Supra-oesophageal weak in VII, well developed in VIII–XII. Gizzard very large but easily compressible in V. Extramural calciferous glands absent. Oesophagus with engorged circumferential vascular striae in VIII–XV; in (XIII?), XIV and XV strongly dilated and with longitudinal striations which correspond with low internal ridges (severely macerated in this region) which suggest some (calciferous?) modification. Intestinal origin XVII; typhlosole absent. Nephridia tufted holonephridia in II–IX, with posteriorly decreasing numbers of coiled loops, discharging presetally in *c* lines; stomate at least from X in which coiling is insufficient to be termed tufted, but anterior tufted nephridia probably are also stomate as a slender neck is demonstrable to the anterior septum. Bladders absent unless terminal dilatations of the ducts of the anterior tufts be considered vestigial bladders.

Holandric (funnels iridescent in X and XI); gymnorchous; seminal vesicles racemose, in IX and XII. Presence of ovaries or ovisacs indeterminable owing to

maceration. Prostates slender coiled only slightly depressed tubes, winding through XVII-XXIV; vas deferens joining the gland near the junction of the sinuous duct. Penial setae present, form not elucidated; length (holotype) 2.25, 2.37, 2.39 mm. Spermathecae 5 pairs; diverticulum (inseminated) single, clavate, uniloculate.

MATERIAL EXAMINED.

Under a rotting log near the old Breiseis Tin Mine dam, Derby, 147°50'E. 41°10'S. Map, 9/4, Mr R. C. Kershaw, 19 Sep 1971 - holotype TM : 262.

REMARKS. This species differs from other Tasmanian species of the subgenus in having midventral genital markings in 11/12 and 12/13 and in transition of the setae from 8 per segment anteriorly to many posteriorly.

TABLE 2

Mean intersetal distances in segment XII in lumbricine species of *Perionychella* (*Perionychella* and *Vesiculodrilus*)

| | no. of specimens | standardized to a periphery of 100 | | | | | | | |
|------------------------------|------------------|------------------------------------|------|-------|-------|-------|-------|-------|------|
| | | aa | ab | bc | cd | dd | dc | cb | ba |
| <i>P. (P.) kershawi</i> | (1) | 12.65 | 5.14 | 11.46 | 10.28 | 33.2 | 9.88 | 12.25 | 5.14 |
| <i>P. (P.) weldboroughi</i> | (1) | 11.57 | 4.96 | 9.92 | 9.92 | 38.84 | 9.92 | 9.92 | 4.96 |
| <i>P. (V.) bithecata</i> | (5) | 12.1 | 7.87 | 12.45 | 12.76 | 21.53 | 13.25 | 12.12 | 7.87 |
| <i>P. (V.) evansi</i> | (2) | 10.35 | 7.71 | 14.28 | 12.98 | 20.09 | 12.98 | 13.9 | 7.71 |
| <i>P. (V.) glandifera</i> | (2) | 9.89 | 4.94 | 18.39 | 8.34 | 27.44 | 8.18 | 17.37 | 5.46 |
| <i>P. (V.) hellyeri</i> | (5) | 12.42 | 8.17 | 12.82 | 12.51 | 20.70 | 12.62 | 12.76 | 8.00 |
| <i>P. (V.) hobartensis</i> | (12) | 11.59 | 7.16 | 13.22 | 13.0 | 21.98 | 12.87 | 13.2 | 6.94 |
| <i>P. (V.) montisarthuri</i> | (1) | 12.5 | 8.8 | 11.11 | 14.81 | 17.59 | 15.74 | 11.57 | 7.87 |
| <i>P. (V.) mortoni</i> | (3) | 11.83 | 6.83 | 15.89 | 11.4 | 19.87 | 11.74 | 15.79 | 6.64 |
| <i>P. (V.) tunnackensis</i> | (1) | 11.74 | 7.04 | 13.15 | 14.08 | 19.72 | 14.08 | 13.15 | 7.04 |

| | no. of specimens | intervals/ab | | | | | | | |
|------------------------------|------------------|--------------|------|------|------|------|------|------|------|
| | | aa | ab | bc | cd | dd | dc | cb | ba |
| <i>P. (P.) kershawi</i> | (1) | 2.44 | 1.00 | 2.23 | 2.00 | 6.46 | 1.92 | 2.38 | 1.00 |
| <i>P. (P.) weldboroughi</i> | (1) | 2.33 | 1.00 | 2.00 | 2.00 | 7.83 | 2.00 | 2.00 | 1.00 |
| <i>P. (V.) bithecata</i> | (5) | 1.54 | 1.00 | 1.58 | 1.62 | 2.74 | 1.68 | 1.54 | 1.00 |
| <i>P. (V.) evansi</i> | (2) | 1.34 | 1.00 | 1.85 | 1.68 | 2.61 | 1.68 | 1.80 | 1.00 |
| <i>P. (V.) glandifera</i> | (2) | 2.00 | 1.00 | 3.72 | 1.69 | 5.55 | 1.66 | 3.52 | 1.10 |
| <i>P. (V.) hellyeri</i> | (5) | 1.52 | 1.00 | 1.57 | 1.53 | 2.53 | 1.54 | 1.56 | 0.98 |
| <i>P. (V.) hobartensis</i> | (12) | 1.62 | 1.00 | 1.85 | 1.82 | 3.07 | 1.8 | 1.84 | 0.97 |
| <i>P. (V.) montisarthuri</i> | (1) | 1.42 | 1.00 | 1.26 | 1.68 | 2.00 | 1.79 | 1.31 | 0.89 |
| <i>P. (V.) mortoni</i> | (3) | 1.73 | 1.00 | 2.33 | 1.67 | 2.91 | 1.72 | 2.31 | 0.97 |
| <i>P. (V.) tunnackensis</i> | (1) | 1.67 | 1.00 | 1.87 | 2.00 | 2.80 | 2.00 | 1.87 | 1.00 |

Perionychella (Perionychella) weldboroughi sp. n.

Fig. 1, 7A, 16F. Table 2

l = 48 mm, w = 1.6 mm, s = 71.

Prostomium tanylobous. First dorsal pore 4/5. Setae 8 per segment in regular longitudinal rows throughout. Nephropores faint in c lines. Clitellum annular

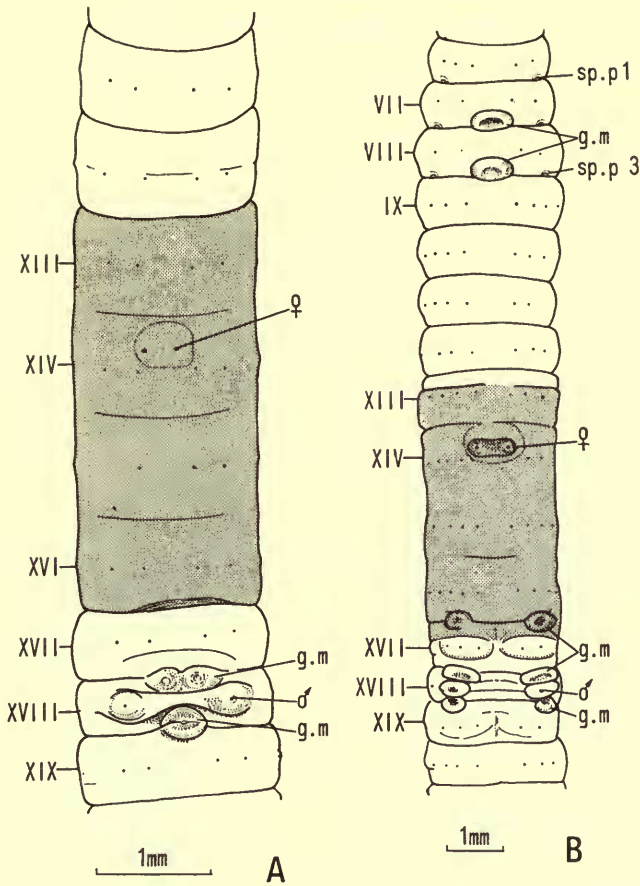


FIG. 7. Genital fields. A, *Perionychella* (*P.*) *weldboroughi*, holotype. B, *P.* (*V.*) *lacustris*, TM: K265.

XIII–XVI. Male pores equatorial in XVIII, on pronounced papillae in *ab* with centres nearer *b* than *a*; preceded by a pair of medianly contiguous small papillae in *aa* at 17/18, with a further midventral unpaired papilla at 18/19. Faint traces of presetal midventral unpaired markings present in VII?, VIII? and IX. Female pores a pair on XIV anterior to and slightly median of *a*. Spermathecal pores 5 pairs in 4/5–8/9 in or slightly lateral of *a*.

Last hearts in XII. Supra-oesophageal very weakly developed. Gizzard moderate, but easily compressible, in V. Calciferous glands absent but oesophagus greatly dilated in XIII–XV in which vascularization is increased and internal longitudinal rugae, though low, are conspicuous. Intestinal origin XVII; typhlosole absent but intestinal wall slightly thicker middorsally. Nephridia simple stomate avesiculate holonephridia commencing in II (funnels demonstrated in the intestinal region); ectal ducts lacking bladders. Holandric (funnels in X and XI iridescent); gymnorchous; seminal vesicles very large, racemose, in IX and XII. Metagynous;

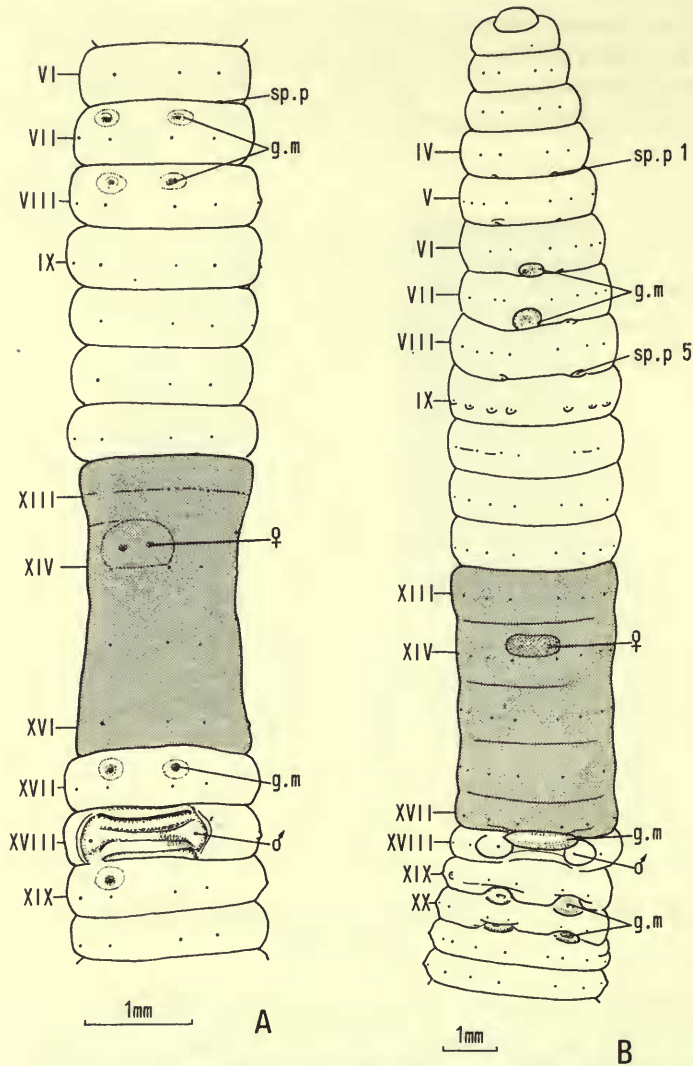


FIG. 8. Genital fields. A, *Perionychella (Vesiculodrilus) bithecata*, holotype.
B, *P. (V.) dilwynnia*, TM: K266.

ovisacs small, in XIV. Prostates flattened, somewhat incised, tubular, in XVIII-XX; vas deferens joining gland near the tortuous duct. Penial setae (holotype) filiform and sinuous, lacking ornamentation but tip apparently missing; length (incomplete?) = 0.42 mm. Spermathecae 5 pairs, diverticulum single, slenderly clavate, uniloculate.

MATERIAL EXAMINED.

1.6 miles from the eastern end of Weldborough Pass, 147°55'E. 41°10'S. Map, 9/3, Dr J. L. Hickman, 26 Aug 1953 - holotype TM: K266.

REMARKS. The midventral genital marking in 18/19 diagnoses this species.

Perionychella (Vesiculodrilus) bithecata sp. n.

Fig. 1, 8A, 16H; Plate 93. Table 2

l = 41, 35 mm, w = 1.5 mm, s = 93, 98.

Prostomium epilobous $\frac{1}{2}$ open. First dorsal pore 4/5. Setae 8 per segment in regular longitudinal rows throughout. Nephropores in *c* lines. Clitellum annular $\frac{1}{2}$ XIII–XVI. Male pores equatorial in XVIII in *ab* on small medianly conjoined papillae; 2 transverse tumid bands spanning the space between the porophores, one anteriorly the other posteriorly in XVIII, each band traversed by a groove which is parallel to but distinct from the intersegmental furrows. Genital markings; 3 pairs of eye-like markings anterior to *a* in VII, VIII and XVII and on the right side only in XIX (holotype); these replaced in paratype 1 by paired markings in *ab*, posteriorly in VI and XVII. Female pores a pair on XIV anteromedian to *a* surrounded by a nonpigmented oval marking filling *aa*. Spermathecal pores 1 pair, in 6/7, in *b*.

Last hearts in XII (latero-oesophageal). Supra-oesophageal moderately developed. Gizzard small to moderate, easily compressible, in V. Calciferous glands absent; oesophagus widest in XIV and XV in which internally it has large, regular longitudinal folds; intestinal origin XVII; typhlosole absent. Nephridia simple stomate, vesiculate, exonephric holonephridia commencing in II (funnels demonstrated at least as far forward as the nephridia of III); bladder transversely ellipsoid and projecting median of the pore (in *c* line) through not truly diverticulate. Holandric (funnels iridescent in X and XI); gymnorchous; seminal vesicles race-mose in IX and XII. Metagynous; ovisacs small in XIV. Prostates depressed tubular, compacted coils in XVII–XXI; Penial setae (paratypes 1, 3) filiform and sinuous; tip inrolled, hooked and with a pair of 'dorsal', short horns visible only under the electron microscope; length (paratype 1) 0.39 mm. Spermathecae 1 pair, with pores in 6/7; the ampulla extending into IX or VIII; diverticulum (inseminated) single, uniloculate, bent clavate.

Genital markings in the holotype and 3 paratypes

| | Specimen | Total number of specimens |
|--|----------------|---------------------------|
| Paired posterior in VI in <i>ab</i> | – P1, P3(R) | 2 |
| Paired presetal in VII in <i>a</i> | H – | 1 |
| Paired presetal in VIII in <i>a</i> | H – | 1 |
| Paired presetal in XVII in <i>a</i> | H – | 1 |
| Paired posterior in XVII in <i>ab</i> | – P1, 2, P3(R) | 3 |
| Unilateral (R) in 18/19 in <i>ab</i> | – P2 | 1 |
| Unilateral presetal in XIX in <i>a</i> (R) | H – | 1 |
| or <i>ab</i> (L) | – P3 | 1 |

H=Holotype; P=Paratypes. R=right. L=left.

MATERIAL EXAMINED.

Hellyer Gorge, 145°35'E. 41°20'S. Map, 7/3, Dr J. L. Hickman, 28 May 1954 – holotype TM: K264; paratype 1 BM(NH): 1972.8.1; paratypes 2, 3 AM: W5186-7; paratype 4 BJ: T2.

REMARKS. The configuration of genital markings in the paratypes differs markedly from that in the holotype but similarity of general morphology, including the bithecal condition (which is unique in the genus), indicates conspecificity.

Perionychella (Vesiculodrilus) dilwynnia (Spencer, 1895)

Fig. 1, 8B, 16J; Plates 94-96

Perichaeta dilwynnia Spencer, 1895: 50-51, Pl. IV, fig. 46-48.

Diporocheata dilwynnia; Michaelsen, 1900: 204; Jamieson 1971b: 83.

1 = 71, 52 mm, w = 3.0, 2.6 mm, s = 104, 118 (Specimens 1 and 2 respectively, throughout account).

Prostomium epilobous $\frac{1}{2}$, open, but deep dorsal canalicula extending to inter-segment 1/2. Peristomium similarly grooved midventrally. First dorsal pore 4/5. Caudal end dorsoventrally depressed. Setae in XII, 16, 14; caudally 24 per segment; dorsal and ventral rows (*a* and *z*) straight throughout but caudally some setae of *z* line are omitted; ventral gap approximately *2ab* throughout; dorsal gap inconstant even over a few segments, usually a definite interruption of the setal circlet but not more than twice the general *zy* width. Nephropores: preclitellar in setal lines 4-5; postclitellar in 4; caudally in 6-7; in a straight lateral row on each side. Clitellum annular, XIII, $\frac{1}{2}$ XIII-XVII. Male pores equatorial in XVIII in mid *ab*, on large prominent papillae; a transversely elongate elliptical papilla filling the space between them in the anterior half of the segment. Paired eye-like genital markings in 19/20 and 20/21 in *ab* and an unpaired postsetal midventral marking in each of VI and VII. Female pores shortly anteromedian to setae *a* of XIV. Spermathecal pores 5 pairs, on small papillae in 4/5-8/9, in *ab*.

Last hearts in XII (latero-oesophageal). Supra-oesophageal well developed in IX-XII, weak in VIII and XIII. Gizzard small, almost rudimentary, in V. Oesophagus simple, extramural calciferous glands absent. Intestinal origin XVII; typhlosole absent. Nephridia simple stomate, exonephric, vesiculate holonephridia throughout, commencing in II; each with large, single preseptal funnel and long, wide, tortuous tubular bladder. Holandric (funnels iridescent); gymnorchous; seminal vesicles racemose, in IX and XII. Metagynous; ovisacs in XIV. Prostates depressed, lobulated tubular, with compressed coils, in XVII-XX (1), XVIII only (2); vas deferens joining junction of gland and duct. Penial setae (specimens 1 and 2) slender, needle-like, not filiform; tip pointed, asymmetrical, convex on one side, straight or slightly concave on the other; ornamentation in profile consisting of alternating V-shaped depressions the border of which, at the angle, projects towards the apex of the seta as an irregular scale; length (specimen 1) = 0.77 mm. Spermathecae 5 pairs; diverticulum (inseminated) single, clavate, uniloculate.

Genital markings. 13/4 - (specimens 1-9) median genital marking in VI absent in specimens 3-6, 8; otherwise agreeing in all respects with specimen 1.

TYPE-LOCALITY. Dee Bridge, 146°35'E. 42°15'S. Map, 13/7.

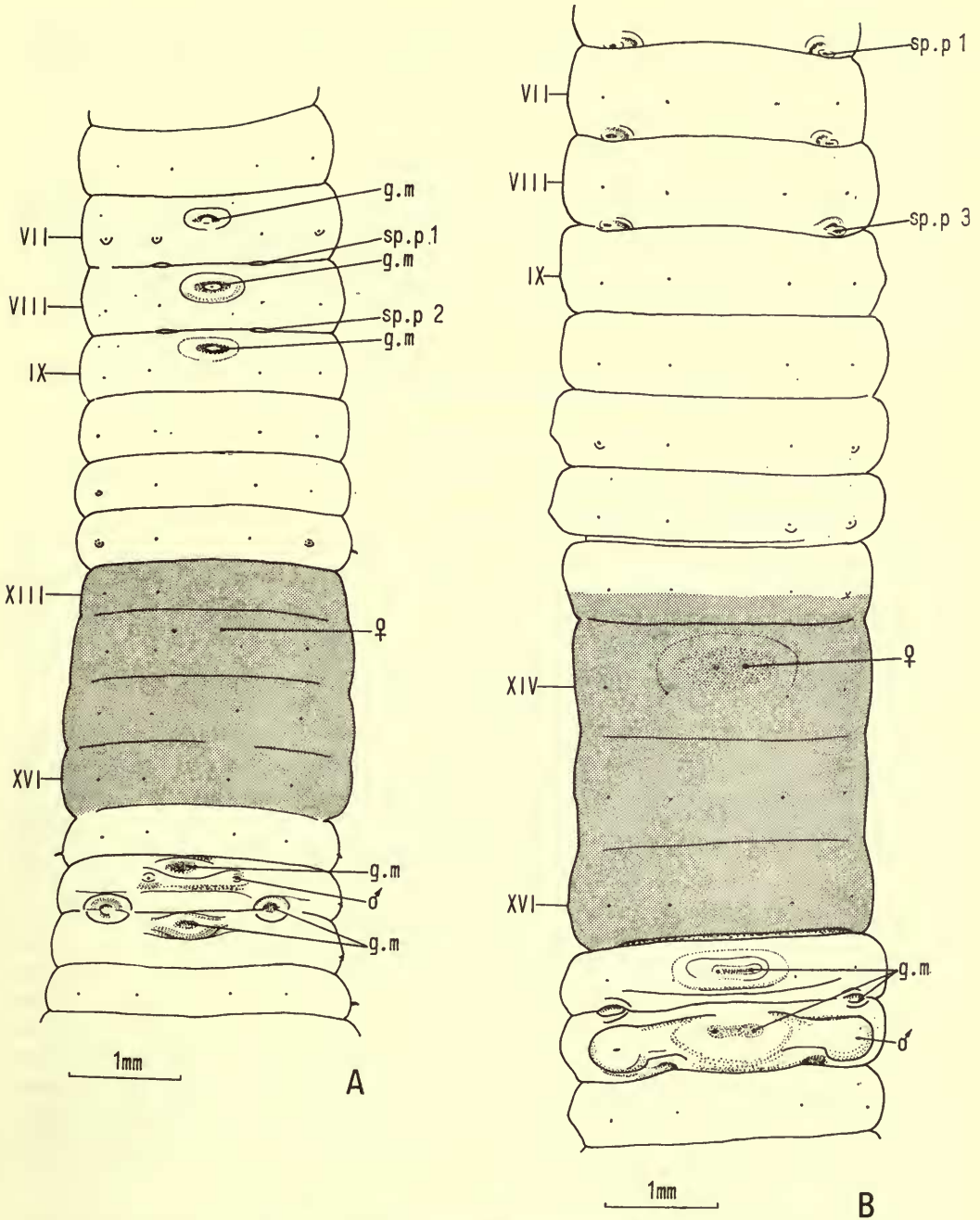


FIG. 9. Genital fields. A, *Perionychella (Vesiculodrilus) evansi*, holotype. B, *F. (V.) hellyeri*, holotype.

MATERIAL EXAMINED.

Tarraleah, 146°25'E. 42°20'S. Map, 13/4, over pipeline, Dr J. L. Hickman, 27 May 1954 - specimens 1-9 TM: K266-274; specimens 10-13 BM(NH): 1972.8.4-7; Butlers Gorge Road, 1.4 miles from Tarraleah, Dr J. L. Hickman, 27 May 1954 - specimens 14-20 TM: K275-281; specimens 21-32 BJ: T3-14; Tarraleah, Lyell Highway, Dr J. L. Hickman, 22 May 1954 - specimens 33-36 AM: W5188-5191.

REMARKS. The new material was collected a few miles from the Dee Bridge type-locality. The type-specimens are lost (Jensz and Smith 1969). It appears from Spencer's description that they differed from the Tarraleah specimens in clitellar extent (XIV-XVII); in location of the paired genital markings in 18/19 and 19/20 and absence of the midventral markings in VI and VII; the median marking in XVIII was present and setal counts agreed closely. Nephridial bladders were not mentioned.

Perionychella (Vesiculodrilus) evansi sp. n.

Fig. 1, 9A, 15C, 16K. Table 2

l = 51 (?) mm (the paratype damaged anteriorly), w = 2.6, 2.5 mm, s = 102, 117.

Prostomium epilobous $\frac{2}{3}$, closed; first dorsal pore (2/3?), 3/4 (holotype). Setae in 8 regular longitudinal rows throughout. Nephropores in *c* lines. Clitellum annular, XIII-XVI. Male pores on small papillae in *a* on XVIII. Five transversely elliptical, unpaired, midventral genital markings in the anterior half of VII, VIII, IX, XVIII and XIX (holotype), that in IX absent in paratype, and a pair of eye-like markings at 18/19 with centres in *b* (both specimens). Female pores a pair in XIV anteromedian of *a*. Spermathecal pores 2 pairs in 7/8 and 8/9, in *a*.

Last hearts in XII (latero-oesophageal). Supra-oesophageal well developed. Gizzard in V (damaged and not recognizable in paratype), moderately large but fairly easily compressible. Calciferous glands absent but oesophagus internally rugose in VI-XV, especially so in XIV and XV in which it is conspicuously dilated, but lacking specialized internal lamellae. Intestinal origin XVI; typhlosole absent. Nephridia simple stomate vesiculate exonephric holonephridia; first seen in III but pores apparently commencing anteriorly in II; funnels present at least as far forward as VII; the bladders at first pyriform but by IX becoming distinctly bilobed, the ectal nephridial duct joining the median lobe. Holandric (funnels very large, only those in X iridescent in the holotype, iridescent in XI also in the paratype); seminal vesicles racemose, in IX and XII. Metagynous; ovisacs very large, multiloculate, in XIV (holotype; not demonstrable in paratype). Prostates appearing racemose, in XVII-XX, XXI but resolvable into a compressed and minutely lobulated tubular form. Penial setae (holotype) needle like, not filiform; tip smooth and rounded; ornamentation absent, length = 0.71 mm. Spermathecae 2 pairs; diverticulum (inseminated) single, clavate, uniloculate.

MATERIAL EXAMINED.

Lake St Clair, 146°10'E. 42°05'S. Map, 13/5, Dr J. W. Evans, Feb 1941 - holotype TM: K282. Same locality, Tasmanian Biological Survey: J20, Feb 1941 - paratype BM(NH): 1972.8.8.

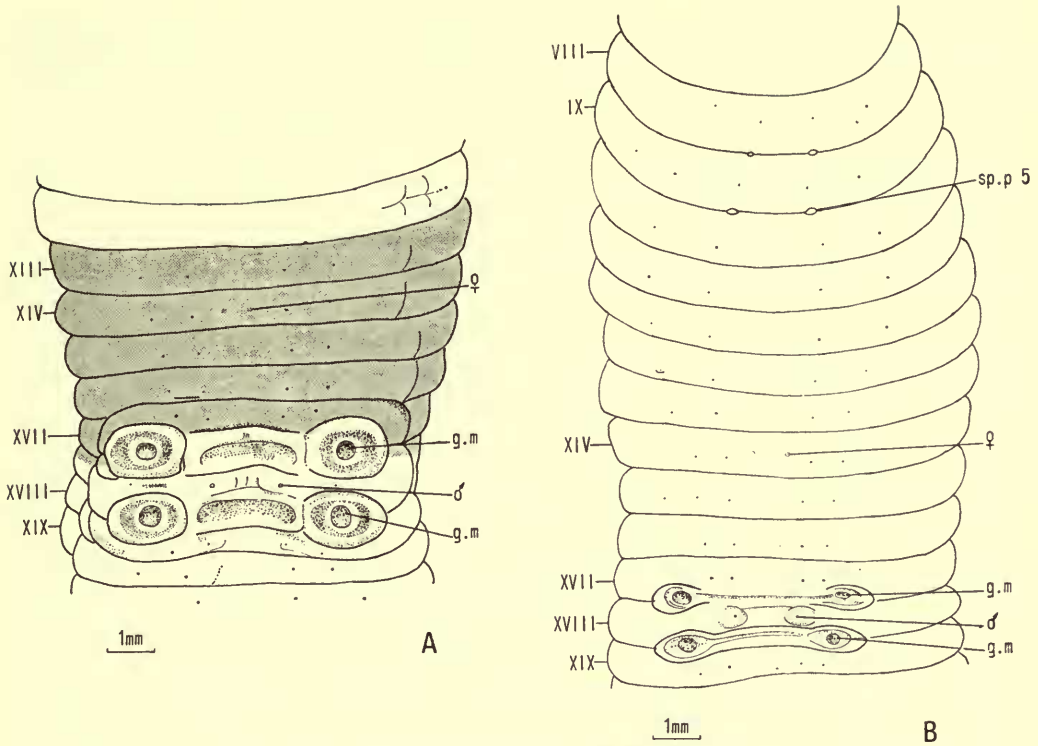


FIG. 10. Genital fields. *Perionychella (Vesiculodrilus) glandifera*: A, holotype; B, paratype.

REMARKS. This species appears to be closest morphologically to *P. (V.) lacustris*. Some differences from the latter are the lumbricine setae, the two pairs of spermathecal pores, the presetal rather than postsetal location of the anterior genital markings and the configuration of those of the male genital field.

***Perionychella (Vesiculodrilus) glandifera* sp. n.**

Fig. 1, 10A, B, 15D, 16L, M. Table 2

l = 75, 73 mm, w = 6.5, 7.5 mm, s = 98.

Prostomium canaliculate, broadly tanylobous. Body rectangular in cross section. First dorsal pore $3/4$ (imperforate? holotype), $4/5$ perforate. Setae 8 per segment in regular longitudinal rows throughout. Nephropores in *c* lines. Clitellum annular, XIII- $\frac{1}{2}$ XVIII (holotype; the paratype is aclitellate). Male pores equatorial in *a* lines of XVIII on weakly developed papillae on the setal ridge; 2 pairs of large sucker-like genital markings with pore-like centres in intersegments 17/18 and 18/19, the centres lateral to *b* lines, each marking spanning the distance between the setal arcs of adjacent segments; a transverse glandular depression linking each marking with that

of the other side (holotype). Two pairs of eye-like transversely conjoined markings shortly lateral of *b* at 17/18 and 18/19 in paratype. Female pores shortly anterior to the setal arc of XIV at 1/3 *aa*. Spermathecal pores minute, 5 pairs in 4/5–8/9 in *a* lines.

Dorsal vessel segmentally bifid in VIII (paratype), IX (holotype)–XVIII; last hearts in XII (latero-oesophageal). Supra-oesophageal weakly developed. Gizzard large, in V but extending well posteriorly. Oesophagus in XV expanded to form a subspherical unpaired calciferous gland with many closely packed internal radial laminae which fill the oesophageal lumen but do not unite centrally. Intestinal origin $\frac{1}{2}$ XVII (paratype) or posterior XVII (holotype); typhlosole absent. Nephridia vesiculate, exonephric holonephridia discharging by large bladders throughout, commencing in II (holotype); those in II forming small tufts and lacking detectable funnels (no nephridia detectable in II in paratype); the remaining nephridia simple and each with a preseptal funnel; bladders in the anterior segments very long, wide tortuous tubes; in VI (holotype) or somewhat more posteriorly (paratype) the bladder is bent near its ectal end and the bend is drawn out slightly as a diverticulum; succeeding bladders are increasingly diverticulate; full development of the diverticulum as a long lateral digitiform process is attained by segment XIX and is maintained to the caudal extremity although caudal nephridia are smaller than those in the anterior region. Holandric (funnels iridescent); cleistorchous, pericardiac testis-sacs formed by longitudinal fusion of septa 9/10, 10/11 and 11/12; seminal vesicles racemose in XI (in the testis-sac) and XII (free). Metagynous. Ovisacs absent (holotype) or present in XIV (paratype). Prostates depressed tubular, compactly coiled, in XVIII–XX (holotype); restricted to XVIII and not fully developed in paratype; vas deferens joining ectal end of gland (holotype); penial setae absent. Spermathecae 5 pairs; diverticulum (inseminated only in holotype) single, clavate, uniloculate.

MATERIAL EXAMINED.

St Helens, on road to Launceston via Scottsdale between 94 and 96 mile posts, 148°15'E. 41°20'S. Map, 10/2, Dr J. L. Hickman, 26 Aug 1953 – holotype TM: K283. St Columba Falls, 147°55'E. 41°20'S. Map, 9/2, Dr J. L. Hickman, 17 Apr 1954 – paratype BM(NH): 1972.8.9.

REMARKS. *Perionychella* (*V.*) *glandifera* is unique among the known Tasmanian species of the genus in the bifid dorsal vessel, the extramural oesophageal gland in XV, in possessing testis-sacs and in location of the seminal vesicles in XI and XII.

Perionychella (*Vesiculodrilus*) *hellyeri* sp. n.

Fig. 1, 9B, 16N, O. Table 2

l = 54, 62 mm, w = 2.6, 3.0 mm, s = 104, 97.

Prostomium indistinctly epilobous $\frac{1}{2}$, open. First dorsal pore 4/5. Setae 8 per segment, the rows becoming irregular in the posterior 12 or 40 segments in which there are 20–24 setae per segment. Nephropores in *c* lines. Clitellum annular, $\frac{1}{2}$ XIII–XVI. Male pores on prominent rounded papillae, equatorial in XVIII, in *b*;

the papillae transversely conjoined by a midventral boss which bears presetally two widely conjoined pore-like markings, a similar boss present with conjoined presetal markings on XVII; a pair of eye-like genital markings present in 17/18 in *b* lines (holotype); presetal markings absent from XVII in paratype 1 and the median boss in XVIII replaced with 2 small circular markings in *aa* joined to the male papillae by slight ridges; eye-like markings present in 17/18. Two pairs of eye-like markings presetally in *b*, on IX and X in paratype 1; absent in holotype. Female pores paired, on XIV, anteromedian of *a*. Spermathecal pores 3 pairs, in 6/7-8/9, in *b*, on small papillae each of which is preceded by a lip-like prominence (holotype, paratypes 1-5).

Last hearts in XII (latero-oesophageal). Supra-oesophageal in VIII-XIII, well developed. Gizzard vestigial (questionably present), in V. Extramural calciferous glands absent but oesophagus enlarged and vascularized with lamellar internal rugae in XIV and XV. Intestinal origin XVII; typhlosole absent. Nephridia simple, vesiculate exonephric holonephridia; preseptal funnel demonstrated in those of III; possibly rudimentary nephridia in II; bladder large, subspherical to transversely elliptical, the lateral extremity protuberant and almost forming a diverticulum. Holandric (gymnorchous) or probably incipiently metandric; only posterior funnels iridescent and seminal vesicles large in XII but vestigial in IX (holotype); male organs of IX and X completely absent in paratypes 1 and 2 (metandric). Metagynous; ovisacs in XIV. Prostates flattened tubular, with lobulated, compacted coils in XVIII-XX, XXI. Penial setae (paratype 1) moderately stout, not filiform, but ectal region sigmoid; tip simple; ectally weakly ornamented with anteriorly directed Λ -shaped scales flush with the surface and commonly in triads; the tip of a reserve seta (paratype 5) has a delicate, hooked extremity; length of a well-developed seta (paratypes 2 and 5) = 1.18, 1.00 mm. Spermathecae 3 pairs; diverticulum (inseminated) single, clavate, uniloculate.

Genital markings of the holotype and 5 paratypes

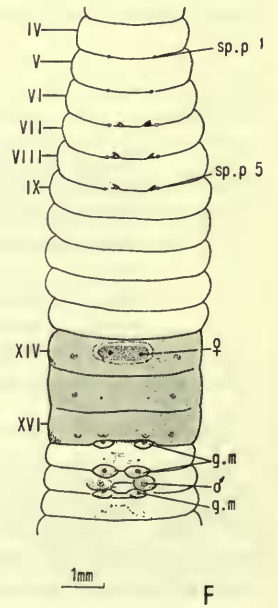
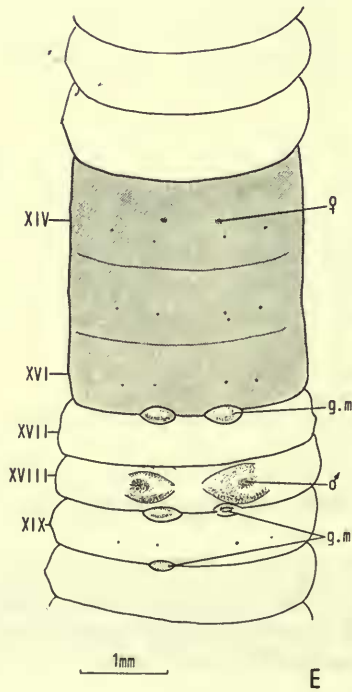
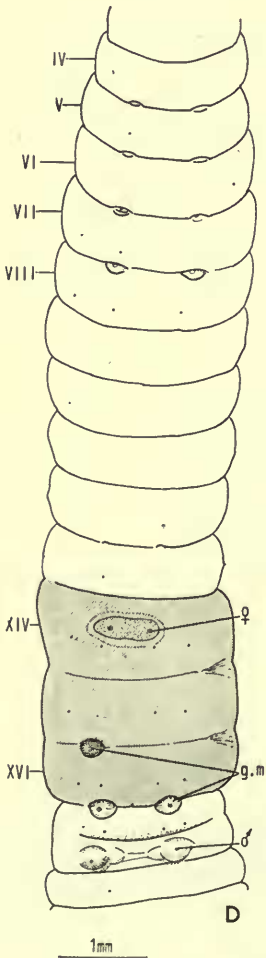
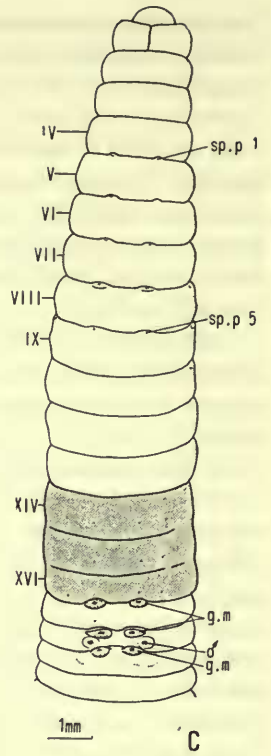
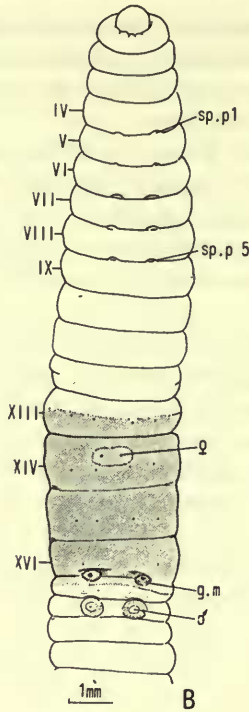
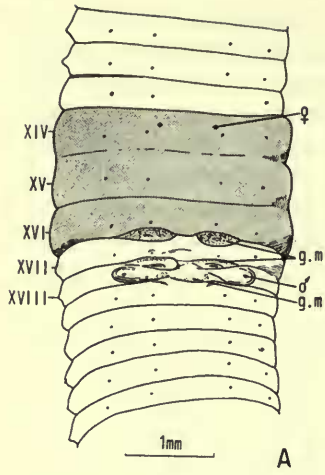
| | Specimen | Total number of specimens |
|---------------------------------------|------------|------------------------------|
| Paired presetal in <i>a</i> of VII | - P1, 5 | 2 |
| Paired presetal in <i>a</i> of VIII | - P5 | 1 |
| Paired presetal in <i>a</i> of IX | - P3, 5 | 2 |
| Paired presetal in <i>b</i> of IX | - P1 | 1 |
| Paired presetal in <i>b</i> of X | - P1 | 1 |
| Paired presetal in <i>aa</i> of XVII | H P2, 3, 5 | 4 |
| Paired presetal in <i>aa</i> of XVIII | H P1-5 | 6 |
| Paired in <i>b</i> in 17/18 | H P1-5 | 6 |

H=Holotype; P=Paratypes.

Spermathecal pores and male porophores invariable in 6 specimens.

MATERIAL EXAMINED.

Hellyer Gorge, 145°35'E. 41°20'S. Map, 7/3, Dr J. L. Hickman, 28 May 1954 - holotype TM: K284; paratypes 1 and 2 BM(NH): 1972.8.10-11; paratypes 3 and 4 AM: W5192-5193; paratype 5 BJ: T15. Mt Arthur, in rainforest, 147°20'E. 41°15'S. Map, 9/1, Mr A. J. Dartnall, 13 Mar 1971 - 2 specimens TM: K285-286.



REMARKS. This species is close morphologically to *P. (V.) montisarthuri* but is readily distinguished from it by the presence of postclitellar genital markings in *aa*.

Perionychella (Vesiculodrilus) hobartensis (Spencer, 1895)

Fig. 1, 11A-F, 15A, B, 16P-R; Plates 97, 98. Table 2

Cryptodrilus hobartensis Spencer, 1895: 37-38, Pl. I, fig. 10, 11, 12.

Plutellus hobartensis; Michaelsen, 1900: 175-176; Jamieson, 1971c: 87.

Cryptodrilus insularis Spencer, 1895: 41-42. Pl. 2; fig. 19-21 (new synonym).

Plutellus insularis; Michaelsen, 1900: 176; Jamieson, 1971c: 87.

Vesiculodrilus hobartensis; Jamieson, 1973a: 225.

Vesiculodrilus insularis; Jamieson, 1973a: 225.

l = 28 mm + (posterior regenerate), w = 2.7 mm, s = 91 +.

Form moderately stout; approximately circular in cross section but flattened between adjacent setae. Prostomium epilobous $\frac{2}{3}$, open but apparently with a transverse groove at about half peristomium; a middorsal groove commencing on the prostomium and continuous throughout the body. First dorsal pore 4/5. Setae readily visible, in 8 regular longitudinal rows throughout, commencing on II; *ab* absent, *cd* present, on XVIII.

Nephropores in *c* lines at the anterior borders of their segments (clitellum and posteriorly). Clitellum annular, strongly protuberant on XIV-XVI but XVII with clitellar modification, especially dorsally over the anterior third; dorsal pores present but imperforate; setae and intersegmental furrows retained but less distinct; nephropores visible. Small indistinct (imperforate) male porophores in *ab* nearer *b*, of XVIII; paired eye-like accessory genital markings in *a* lines in 16/17, 17/18 and 18/19, the anterior pair large and more conspicuous than the second pair, the posterior pair rudimentary. Female pores minute, shortly anteromedian of *a* in XIV, each with a distinctly visible white 'halo'. Spermathecal pores not visible.

Last hearts in XII (latero-oesophageal); connections of the 4 pairs of hearts with the dorsal vessel presumably present but not verified with certainty as hearts were brittle and were separate from the dorsal vessel on examination. Supra-oesophageal well developed in VIII-XII, and with a slender posterior continuation into XIII and apparently intramurally to $\frac{1}{2}$ XV.

Gizzard in V, almost cylindrical and only slightly wider than the oesophagus but recognizable by its muscular sheen; easily compressible; preceded in IV by a less muscular proventriculus of the same width, from which it is not separated by any appreciable constriction. Oesophagus narrow (though not much narrower than the gizzard) and not evidently vascularized in VI and VII; still narrow but with intramural circumferential vascular striae, which form the supra-oesophageal vessel in VIII-XI; forming a segmental unpaired annular dilatation in each of segments XII,

FIG. 11. Genital fields. *Perionychella (Vesiculodrilus) hobartensis*: A, lectotype; B, 13/6, TM: K293; C, 14/2, TM: K299; D, 14/1, TM: K294; E, 19/2, AM: W5194; F, 14/6, TM: K306.

XIII and XIV, the dilatations increasing in size posteriad; the oesophagus also widened, but less so, to $\frac{1}{2}$ XV but narrow and chloragenous looking in the posterior half of this segment; the internal walls of the dilatations with rounded longitudinal ridges too low to be considered lamellae. Intestinal origin XVII; typhlosole absent.

| Specimen | Genital markings | | | | | |
|----------------|------------------|-------|-------|-------|-------|-------|
| | 15/16 | 16/17 | 17/18 | 18/19 | 19/20 | 20/21 |
| Spencer, 1895 | | + | + | + | + | |
| Lectotype | | + | + | + | ?+ | |
| 7/2 | | + | + | + | + | |
| 8/2 | | R | | | | |
| 8/2 | + | | | | | |
| 10/1 | | | | | | |
| 10/1 | | | + | | + | + |
| 13/6 | | | | | | |
| 14/1 | | + | | | | |
| 14/1 | R | | | | | |
| 14/1 | | + | | | | |
| 14/1 | | + | | | | |
| 14/1 | | + | | | | |
| 14/1 | | + | | | | |
| 14/2 | | + | + | + | | |
| 14/3 | | + | + | + | ? | |
| 14/4 | | + | L | + | + | |
| 14/5 Lenah V | | + | + | + | + | |
| 14/5 Sandy Bay | | + | + | + | + | R |
| 14/6 Risdon | | + | + | | | |
| 14/6 E. Risdon | | + | + | + | | |
| 14/6 | | + | + | + | + | |
| 14/6 | | + | + | + | | |
| 19/2 | | + | | + | R | |
| 19/2 | | + | | + | | |
| 19/3 | | + | + | | | |

L=left only; R=right only.

Nephridia simple vesiculate holonephridia throughout; the first discharging at intersegment 2/3, each with a wide elongate bladder bent into a U or J shape, all bladders discharging in front of setae *c*; 'necks' to septa seen but no funnels demonstrated with certainty. Holandric (funnels iridescent in X and XI); seminal vesicles not recognizable. Prostates represented only by thick muscular ducts each with the form of a short, straight, entally narrowing cone. Penial setae not detectable in the lectotype and not reported by Spencer (1895); demonstrated in one or (loc. 19/2) two specimens from each of localities 7/2, 8/2, 10/1, 14/1, 14/5, 14/6 and 19/2; filiform and sinuous, tip frequently worn or damaged but intact in 14/5 and 14/6 in which it is widely bifid, while simple and hooked in 7/2; ornamentation a few faint longitudinal ridges (14/5, 14/6) or groups of several scarcely protuberant, approximately palmately arranged, apically directed teeth at intervals near the tip (7/2) or a few very faint triangular marks and longitudinal ridges (14/6); length = 0.97, 1.56 mm (19/2), 1.71 mm (14/6). Ovaries (lamine with several strings of large oocytes) and

stout funnels in XIII; ovisacs absent. Spermathecae 5 pairs, the last in IX; with ovoid ampulla sessile on the body wall and a lateral clavate diverticulum as long as or longer than the ampulla. In one spermatheca the diverticulum is very short and there is a further diverticulum on the median aspect of the spermatheca further entally. Length of the right spermatheca of IX = 0.75 mm; ratio total length: length diverticulum = 0.8.

Other variations. Spermathecal pores are 4 pairs in the material listed above from localities 7/2 and 14/1, but 5 pairs in all other specimens examined. The gizzard is very large in specimens from locality 10/1, small to vestigial in all others. Intestinal origin is XVII (Spencer 1895; lectotype; localities 8/2, 10/1, 13/6, 14/2, 14/3, 14/4, 14/5, 14/6); $\frac{1}{2}$ XVII (locality 14/1); XVI (locality 14/6, 19/2) or $\frac{1}{2}$ XVI (locality 7/2). Penial setae are present in all specimens examined with the exception of the lectotype. The latter specimen lacks seminal vesicles, has prostate ducts but no glands and has abnormal spermathecae. These features suggest that it is a parthenogenetic, uniparental morph and that absence of penial setae, in a species normally possessing these, is further evidence of parthenogenesis.

Ovisacs were demonstrated for specimens from all localities excepting 13/6 and 14/5 and the lectotype.

TYPE-LOCALITIES. Parattah and Mt Wellington.

MATERIAL EXAMINED.

Parattah, 147°25'E. 42°20'S. Map, 14/1, Baldwin Spencer collection, Jan 1893 – the previously undissected, clitellate lectotype, in poor condition, NMV: G50. The two paralectotypes, G51, were examined but were not used for the above account as one is broken in two at the clitellum and the other is imperfectly clitellate.

The following new material has been identified on external and internal anatomy: Fern Glade, Emu River, 145°55'E. 41°05'S. Map, 7/2, Dr J. L. Hickman, 24 Aug 1954 – TM: K287-288. Great Lake, near stones around base of gum tree, slopes of lake, 146°45'E. 41°55'S. Map, 8/2, Dr J. L. Hickman, 26 May 1954 – TM: K289-290. Goulds County, near Lottah, fireplace at creek, 148°05'E. 41°15'S. Map 10/1, Dr J. L. Hickman, 16 Apr 1954 – TM: K291-292. Marlborough Highway, near Bronte, 146°30'E. 42°10'S. Map, 13/6, Dr J. L. Hickman, 26 May 1954 – TM: K293. Parattah (type-locality) 147°25'E. 42°20'S. Map, 14/1, under moss, in earth at base of cliff, also in earth along sides of logs. Map, 14/1, Professor V. V. and Dr J. L. Hickman, 18 Aug 1954 – TM: K294-298. Tunnack, under logs and stones, damp conditions, 147°30'E. 42°25'S. Map, 14/2, Dr J. L. Hickman, 18 Aug 1954 – TM: K299. Collinsvale near Hobart, Myrtle Forest, 147°05'E. 42°50'S. Map, 14/3, Dr J. L. Hickman, 8-9 Nov 1955 – TM: K300-301. Mt Wellington (type-locality) 147°15'E. 42°55'S. Map, 14/4: under stones, creek, Bett's Vale, Dr J. L. Hickman, 4 Mar 1954 – TM: K302; Shoobridge Bend Track, approx. 580 m altitude, in loam and clay in Eucalypt-fern woodland, B. G. M. Jamieson and E. Bradbury, 19 Aug 1971 – TM: K303. Lenah Valley, near Newton Falls, 147°20'E. 42°50'S. Map, 14/5, Dr J. L. Hickman, 24 Jun 1957 – TM: K304. Mt Nelson, Sandy Bay, 147°20'E. 42°55'S. Dr J. L. Hickman, 11 Sep 1953 – TM: K305. Risdon, 147°20'E. 42°50'S. Map, 14/6, Professor V. V. Hickman, 26 Jun 1947 – TM: K306-307; East Risdon, from under stones on hill and in valley, Dr J. L. Hickman, 14 Aug 1954 – BM(NH): 1972.8.15-17. Eaglehawk Neck, under bark, 147°55'E. 43°00'S. Map, 19/2, Dr J. L. Hickman 1954 – AM: W5194-5198; BJ: T16-18. Tinderbox, under fallen eucalyptus leaves, 147°20'E. 43°05'S. Map, 19/3, Dr J. L. Hickman, 4 Aug 1957 – TM: K308.

REMARKS. The above account of the lectotype confirms and considerably augments Spencer's description. As shown in the table of field-variation, the accessory

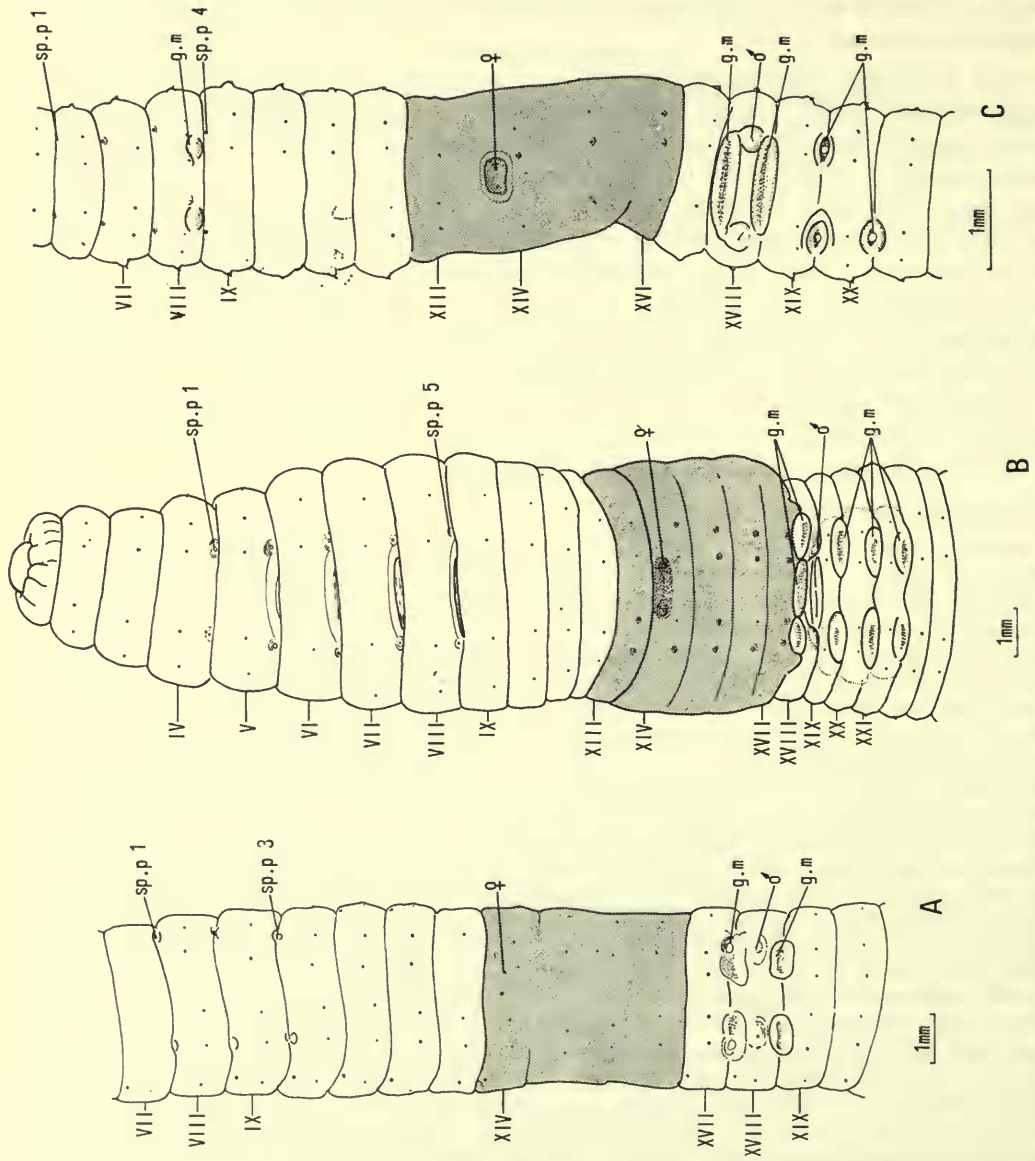


FIG. 12. Genital fields. A, *Perionychella (Vesiculodrilus) montisarlhivi*, holotype. B, *P. (V.) mortoni*, 14/4, BM(NH): 1972.8.19. C, *P. (V.) pederensis*, holotype.

genital markings were more numerous in the material described by Spencer but the evidence offered by Jenz and Smith (1969) for regarding the lectotype which they selected as part of the type-series is satisfactory. Location of paired genital markings in intersegmental furrow 16/17 is almost constant for the species, the sole exceptions in the material examined being those from Goulds County (10/1). The latter specimens are also exceptional in having genital markings in 20/21 (seen, however, in the right side in a Sandy Bay specimen (14/5)) and have a very large gizzard. The possibility that these, and perhaps specimens from other localities, are subspecifically or specifically distinct from the type-population deserves further investigation but on present evidence recognition of distinct taxa is not justified.

Perionychella (Vesiculodrilus) lacustris (Stephenson, 1924)

Fig. 1, 7B, 16I

Perionyx lacustris Stephenson, 1924 : 546-547.

Diporochoeta lacustris : Jamieson, 1971b : 83.

l = 45-60 mm, w = 2.4-3.0 mm, s = 95-107.

Prostomium epilobous $\frac{4}{5}$, wedge-shaped (type) or tanylobous (Bronte). First dorsal pore 4/5. Setae on XII 18 (type), 22 (Stephenson), 14 and 16 (Bronte); caudally (Bronte) 16 and 23; 20 on V and XIX, 22 on IX (Stephenson). The dorsal setal gap regular anteriorly and in the midbody equalling 2-3yz, but irregular and indistinct caudally; ventral gap regular throughout, equalling or > 2ab anteriorly. Clitellum annular $\frac{1}{2}$ XIII- $\frac{1}{2}$ XVII. Male pores in *b* on prominent ovoid papillae occupying *ac* on XVIII. Paired eye-like markings in *bc* in 16/17, 17/18 and 18/19, those of 17/18 slightly median of the others; a median sucker-like pad postsetal ventrally in each of VII and VIII; an indistinct glandular tumescence present on each side in *ac* on XVII and XIX. Female pores paired in XIV anteromedian of *a*. Spermathecal pores 3 pairs, in 6/7 to 8/9, on small papillae in *cd*, closer to *c*.

Last hearts in XII (latero-oesophageal). Supra-oesophageal in VIII-XII, well developed. Gizzard small, almost vestigial, in V, hidden in septal glands. Calciferous glands absent but in the type the oesophagus is swollen and vascularized, and has low internal rugae, in XIV and XV. Intestinal origin $\frac{1}{2}$ XVII; typhlosole absent. Nephridia simple, stomate, vesiculate, exonephric holonephridia commencing (but rudimentary?) in II (preseptal funnel demonstrated in XIV); bladders large, sub-spherical, tapering ectally or, in the type, represented at most by slight intraparietal dilatations of the terminal duct. Holandric (funnels iridescent); gymnorchous; seminal vesicles racemose, in IX and XII. Metagynous; ovisacs large in XIV. Prostates tubuloracemose, in XVII to XX (type) or to XXI, XXII (Bronte); only partially resolvable into a simple linear arrangement; depressed, deeply incised and lobulated; vas deferens (see in Bronte specimens only) joining gland near its muscular duct. Penial setae delicate, filiform, sharply pointed; apical extremity rounded; ornamentation absent; length? Penial setae present in the type but not examined. Spermathecae 3 pairs; diverticulum (inseminated) single, clavate, uniloculate.

TYPE-LOCALITY. Great Lake, under stones in water at margin of the lake, 146°45'E. 41°55'S. Map, 8/2.

MATERIAL EXAMINED.

Syntypes, BM(NH) : 1924.10.21.1-5, of which one, referred to as 'type' in the above account, was closely examined.

Lyell Highway, 5 miles from Bronte towards Hobart, 146°35'E. 42°15'S. Map, 13/7, Dr J. L. Hickman, 24 May 1954 - two specimens TM : K265 and BM(NH) : 1972.8.2.

REMARKS. The new description of a type-specimen in the above account considerably augments Stephenson's description. In this type-specimen, which had not been previously dissected, and in the single one of the type-specimens which had previously been dissected, the following observations of Stephenson are not confirmed and are considered incorrect : clitellum in XIV-XVI ; gizzard in VI ; intestinal origin (about) XVIII ; penial setae absent. Genital markings are similar in the two specimens and include midventral markings in VII and VIII.

P. (V.) montisarthuri is morphologically close to this species but shows sufficient differences to be considered a distinct species. These differences include the setal counts, the bilobed nephridial vesicles, the sessile spermathecae and the precise configuration of the genital field.

Perionychella (Vesiculodrilus) montisarthuri sp. n.

Fig. 1, 12A, 15H, 16S. Table 2

l = 79 mm, w = 3.6 mm, s = 86.

Prostomium epilobous $\frac{1}{2}$, open. First dorsal pore $\frac{3}{4}$. Setae on XII 8 (10 on XI) ; caudally, 14 or 16 per segment ; the dorsal gap regular anteriorly and, in the mid-body, equalling $\frac{2}{3}$, irregular caudally ; ventral gap regular throughout, equalling $\frac{2}{3}$ anteriorly. Nephropores in a single straight series on each side in setal line 3 anteriorly and in the mid-body ; caudally in s.l. 4-5. Clitellum, annular $\frac{1}{2}$ XIII-XVI. Male pores in *b* on small, flat, ovoid markings on XVIII ; two ovoid genital markings occupy the space from *a* to a little lateral of *b* at 17/18 and 18/19. Female pores paired on XIV, anterior and slightly median to *a*. Spermathecal pores 3 pairs in *b* in 6/7-8/9, on small papillae each of which is succeeded by a small ovoid marking on the posterior segment.

Last hearts in XII (latero-oesophageal). Supra-oesophageal in VIII-XII, well developed. Gizzard in V, moderately large but only weakly muscular. Calciferous glands absent. Oesophagus with circumferential vascular striae in VII-XIV, widest in XIV and XV in which internally there are numerous radial lamellae which almost occlude the lumen ; narrow in XVI in which there are a few, low radial folds. Intestinal origin $\frac{1}{2}$ XVII ; typhlosole absent. Nephridia simple stomate, vesiculate, exonephric holonephridia commencing in II (funnels demonstrated in the forebody) ; bladders at first elongate avoid but by VI with a suggestion of a lateral basal lobe ; thereafter the lateral lobe increases in size relative to the median portion (the latter receiving the nephridial duct) until, by about XIX, the bladder is broader than long and consists of two approximately equal lobes, the lateral lobe constituting a broadly

sessile diverticulum; caudally the bladders are less distinctly bilobed. Holandric (funnels iridescent in X and XI), gymnorchnous; seminal vesicles racemose, in IX and XII. Metagynous; ovisacs small in XIV. Prostates depressed very tortuous tubes, in XVII-XXI; double vas deferens joining the gland shortly ental of the slender, sinuous muscular duct. Penial setae (holotype) slender, strongly curved, almost filiform with delicate thinner, elongate tip; ensheathed in setal follicle and not suitable for electron microscopy; length (?), incomplete. Spermathecae 3 pairs, diverticulum (inseminated) single, clavate, uniloculate, exceptional in joining the ectal end of the broad subspherical ampulla; ampulla almost sessile on the parietes.

MATERIAL EXAMINED.

Mt Arthur, from rainforest, 147°20'E. 41°15'S. Map, 9/1, Mr A. J. Dartnall and Mr R. C. Kershaw, 15 Oct 1971 - holotype TM: K309.

REMARKS. This species is morphologically close to *P. (V.) hellyeri* (q.v.)

Perionychella (Vesiculodrilus) mortoni (Spencer, 1895)

Fig. 1, 12B, 15E-G, 16T; Plates 99-102. Table 2

Cryptodrilus mortoni Spencer, 1895: 36-37, Pl. 1, fig. 7-9.

Plutellus mortoni; Michaelsen, 1900: 176.

Woodwardiella mortoni; Jamieson, 1970: 104, 105; 1971c: 92.

Dimensions (see Variation). Anatomy (specimen 1, locality 14/4, 19 Aug 1971): Prostomium canaliculate, tanylobous. First dorsal pore 4/5. Setae in 8 regular longitudinal rows throughout. Nephropores conspicuous, commencing anteriorly in II in *c* lines but shortly below *c* lines behind the midclitellum. Clitellum annular, XIII-XVII, strongly developed and pigmented in XIV-XVII, unpigmented and weakly developed in XIII; possibly some slight clitellar modification in XVIII. Male pores on small papillae in *ab* of XVIII. Accessory genital markings: paired elliptical pads with depressed centres in *ab* in 17/18, 19/20, 20/21 and 21/22, those in 17/18 with centres slightly lateral of those of the other markings and truly intersegmental; the markings in 19/20-21/22, though intersegmental actually postsetal in XIX-XXI, respectively; a median elliptical pad present in 17/18 bridging the paired markings of the intersegment. Median markings each with the form of a depressed transverse intersegmental band with anterior rim in *aa* in 5/6-8/9. Female pores anteromedian of setae *a* of XIV, midway between the setal arc and anterior border of the segment in a common oval field. Spermathecal pores 5 pairs on minute circular papillae immediately in front of intersegmental furrows 4/5-8/9, in *a* lines.

Last hearts in XII (latero-oesophageal). Supra-oesophageal well developed, in VIII- $\frac{1}{2}$ XIII. Gizzard very large and firm, in V but projecting posteriorly to the level of XI. Calciferous glands absent. Oesophagus strongly vascularized and increasingly dilated in XIII-XVI with well-developed internal vascular rugae, especially in XV and XVI. Intestinal origin XVIII; typhlosole absent. Nephridia stomate, vesiculate exonephric holonephridia commencing in II (preseptal

funnel demonstrated for those of II); tortuously coiled but simple, none tufted; bladders at first elongate, wide tubes, each of slightly irregular diameter; by XII bent midway at a right angle; thereafter with a lateral diverticulum extending from the bend, the portion ectal to the diverticulum being eliminated after a few segments. Holandric (funnels iridescent in X and XI); gymnorchous; seminal vesicles race-mose in IX and XII. Metagynous; ovisacs present. Prostates much coiled depressed tubes, in XVIII-XXI; vas deferens joining the duct shortly ectal of the gland. Penial setae short and moderately stout, the tip irregular, widened, roughly spatulate and bent a little or through a right angle, this apical modification visible under the light microscope; shaft ornamented ectally with a few groups of anteriorly directed scarcely protuberant teeth regularly spaced along it; the surface of the seta undercut beneath them; length 0.5 mm (3 setae, Mt Wellington and East Risdon specimens, as illustrated). Spermathecae 5 pairs; diverticulum (inseminated) single, clavate, uniloculate.

Variation. A minimum of two specimens from each of localities 7/2, 9/2, 14/3, 14/4, 14/5, 14/6 and the single specimen from 19/2 were examined for variation in external characters. Variation in internal anatomy is described for at least one specimen from each locality.

Genital markings. Postsetal genital markings were present in *aa* in each of segments IV-VIII in all specimens but in those from Fern Glade (locality 7/2) these were exceptional in being paired. Paired markings were present in 17/18 and post-setally in each of segments XIX, XX and XXI, with the exception that those in XXI were absent in one of the two specimens from each of localities 9/2, 14/3 and 14/5 and from most East Risdon specimens (14/6). The median genital marking in 17/18, though characteristic of the species, is absent from most but not all of the East Risdon specimens.

Spencer did not observe genital markings in IV-IX (these are often faint in the new material) but he depicted median and paired markings in 17/18, as here described, and paired markings in intersegments 18/19 and 19/20. The latter two pairs were presumably postsetal rather than intersegmental and it appears probable from the present study that they lay in segments XIX and XX.

Other variation. $l = 56-212$ mm, $w = 3.5-6.5$ mm, $s = 113-274$. Prostomium epilobous $\frac{1}{2}-\frac{2}{3}$, epitanylobous or tanylobous; often canaliculate. First dorsal pore usually in 4/5, rarely in 3/4 or 5/6. Body strongly canaliculate to not canaliculate.

Variation from the description in internal characters occurs in the intestinal origin which is XVII in 9/2 and 19/2; in the presence of a low dorsal intestinal ridge, though no true typhlosole is present, in 9/2 and 14/6; and in the absence of diverticula of the nephridial bladders in 9/2. Absence of nephridial diverticula is especially noteworthy and is a variation hitherto unknown intraspecifically in otherwise diverticulate species. At present there is insufficient justification for taxonomic recognition of the variant.

MATERIAL EXAMINED.

Approximately 100 sexual specimens were examined from the following localities: Fern Glade, Emu River, Burnie, 145°55'E. 41°05'S. Map, 7/2, Dr J. L. Hickman, 24 Aug 1954. Mt Arthur (east), wet sclerophyll forest, 147°20'E. 41°15'S. Map, 9/1, Mr A. J. Dartnall and

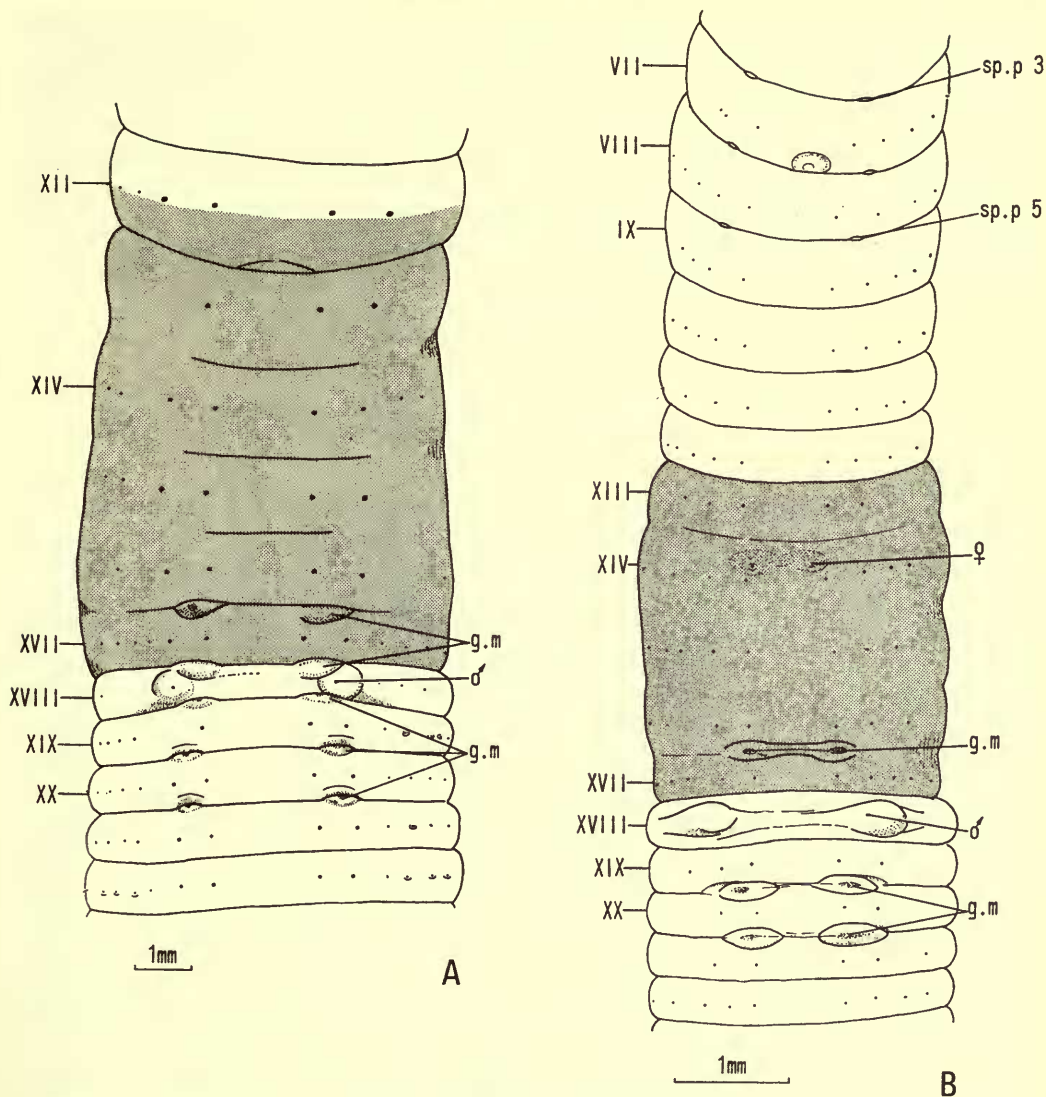


FIG. 13. Genital fields. *Perionychella (Vesiculodrilus) obliquae*: A, holotype; B, 17/1, AM: W5202.

Mr R. C. Kershaw, 15 Nov 1971. St Columba Falls, 147°55'E. 41°20'S. Map, 9/2, Dr J. L. Hickman, 17 Apr 1954. Collinsvale, near Hobart, in Myrtle Forest, 147°10'E. 42°50'S. Map, 14/3, Dr J. L. Hickman, 8-9 Nov 1955. Mt Wellington, 147°15'E. 42°55'S. Map, 14/4, Dr J. L. Hickman, 13 Jan 1954; Dr J. L. Hickman, 27 Oct 1955; Mr W. Radford, Apr 1952; Professor V. V. Hickman, 28 Jun 1947; 13 Sep 1951 - BJ: T19-20; Betts Vale, Dr J. L. Hickman, 4 Mar 1954 - AM: W5199-5201; Shoobridge Bend track, approx. 580 m, Dr B. G. M. Jamieson and Mr E. A. Bradbury, 19 Aug 1971 - BM(NH): 1972.8.18-25. Hobart, Waterworks Road, under stones, 147°20'E. 42°50'S. Map, 14/5, Dr J. L. Hickman, 17 Aug 1954. Lenah Valley, track along Newtown Creek, Dr J. L. Hickman, 15 Sep 1953; Lenah Valley, under stones near Newtown Falls, Dr J. L. Hickman, 24 Jun 1957 - BM(NH): 1972.8.26-30;

Sandy Bay, Dr J. L. Hickman, Sep 1954; Domain, 14 Aug 1954. East Risdon, under stones on hill and in valley, 147°20'E. 42°50'S. Map, 14/6, Dr J. L. Hickman, 14 Aug 1954 - BJ: T21-22; Risdon, Professor V. V. Hickman, 26 Jun 1947. Eagle Hawk Neck, 147°55'E. 43°00'S. Map, 19/2, Dr J. L. Hickman, 13 May 1954. Tasmania: T.M. 15527/K97, Dr J. L. Hickman. All specimens lodged in the Tasmanian Museum (K97, K402-419) except where indicated above.

REMARKS. This species and *P. (V.) hobartensis* are the most widespread and commonly found megascolecoid earthworms in Tasmania and are morphologically close. A notable difference is location of the paired genital markings at the posterior borders of their segments in *mortoni* whereas in *hobartensis* they are intersegmental.

Perionychella (Vesiculodrilus) obliquae sp. n.

Fig. 1, 13A, B, 16U, V

l = 115 mm (holotype; paratype 1 is a posterior amputee), w = 6.6, 6.0 mm, s = 118.

Prostomium epilobous $\frac{1}{2}$, open. First dorsal pore $\frac{3}{4}$. Setae on XII 27, 25; caudally 40, 38; ventral break distinct throughout, equal to *ab* in forebody and *3ab* posteriorly; dorsal gap not distinct caudally being equal to dorsal couple (*yz*); distinct anteriorly, equalling *2yz*. Nephropores difficult to observe, anteriorly in setal lines 6 and posteriorly in s.l. 8 (holotype) or 8-9 (paratype 1). Clitellum annular, $\frac{1}{2}$ XII-XVII. Male pores on small papillae in *b* lines. Five pairs of eye-like markings on the anterior margins of segments XX and XXI in *b* lines and on segments XVII, XVIII and XIX in *ab*. Female pores paired anterior and a little median to *a* on XIV. Spermathecal pores 5 pairs, in $\frac{4}{5}$ - $\frac{8}{9}$ in *ab* on small papillae.

Last hearts in XII (latero-oesophageal). Supra-oesophageal in VII-XIII, very well developed. Gizzard small, almost vestigial, in V. Extramural calciferous glands absent; intestinal origin $\frac{1}{2}$ XVII; typhlosole absent. Nephridia simple exonephric, vesiculate holonephridia commencing in II; preseptal funnels present at least from III posteriorly; bladders long, tubular or somewhat dilated, bent into a U or V shape. Holandric (funnels iridescent); gymnorchous; seminal vesicles racemose, in IX and XII. Metagynous; large ovisacs in XIV. Prostates depressed tubular, somewhat lobulated, with several bends compacted into a circular outline and spuriously appearing racemose, in XVII-XIX. A small follicle but no seta present in *a* of XVIII in the holotype; penial seta from AM: W5202 very slender, straight, unornamented (under light microscope), length = 0.58 mm; a vestigial seta from paratype under the electron microscope displays no ornamentation; tip pointed, aquiline, length = 0.34 mm. Spermathecae 5 pairs; diverticulum (inseminated) single, clavate, uniloculate.

MATERIAL EXAMINED.

Obliqua-forest, 2 miles inland, south of Interview River, 144°55'E. 41°35'S. Map, 6/1, Mr W. Jackson, 31 Dec 1953 - holotype TM: K310; paratype 1 BM(NH): 1972.8.31. Port Davey, Kelly's Beach, 145°55'E. 43°20'S. Map, 17/1, Tasmanian Biological Survey: J17, Jan 1940 - AM: W5202.

REMARKS. Differences from the Interview River type-specimens shown by the Port Davey specimen are as follows: clitellar width 2.7 mm; first dorsal pore $\frac{4}{5}$;

setae 22 in segment XII; accessory genital markings absent at 17/18 and 18/19; a midventral circular genital marking present posteriorly in VII (possibly an artefact); gizzard moderate in size; intestinal origin XVII, not $\frac{1}{2}$ XVII; nephridial bladders subspherical though ectally tapering. These differences do not appear sufficient for recognition of a distinct species for the Port Davey material, especially as only a single specimen is available. Larger series from both localities are needed.

The genital field of this species is reminiscent, though substantially different from, that of *P. (V.) hobartensis* which *obliquae* closely resembles. It differs conspicuously from *hobartensis* and from *P. (V.) tunnackensis*, to which it is also morphologically close, in the perichaetine arrangement of its setae.

***Perionychella (Vesiculodrilus) pedderensis* sp. n.**

Fig. 1, 12C, 16W

l = 50 mm, w = 1.6 mm, s = 123.

Prostomium canaliculate, indistinctly epilobous $\frac{1}{2}$, open. Dorsal pores absent. Forebody dorsoventrally depressed; hindbody with wide dorsal gutter; anus terminal but deeply incising the pygidium dorsally and ventrally. Setae 10 per segment anteriorly, increasing to 12 per segment caudally, rows regular; dorsal and ventral gaps large, the dorsal larger. Nephropores? Clitellum annular, XIII–XVI. Male pores in *ab* of XVIII on small papillae. Accessory genital markings: a midventral tumid pad traversing *bb* in each of intersegments 17/18 and 18/19, each pad with a deep groove corresponding with the intersegment; paired eye-like genital markings centred in *a* lines in 19/20 and 20/21 (that on the left in 20/21 barely perceptible) and posteriorly in VIII shortly lateral of *a* lines. Female pores at $\frac{1}{3}$ *aa*, midway between the setal arc and the anterior border of XIV. Spermathecal pores 4 pairs, minute, in 5/6 shortly lateral of *a*, in 6/7 in *ab*, in 7/8 and 8/9 in *b*.

Last hearts XII. Suboesophageal VIII–XIII. Gizzard moderate, in VI. Oesophagus simple; intestinal origin XVII; typhlosole absent. Holonephridia commencing in II but appearing rudimentary to VII; each with a thick-walled subspherical bladder discharging presetally in *c* line; preseptal funnel well developed. Holandric (funnels iridescent); gymnorchous; seminal vesicles racemose, in IX and XII. Metagynous; large ovisacs in XIV. Prostates thickly tubular, 1 pair, in XVIII–XIX, or XX; vas deferens joining ectal limit of gland. Penial setae present (holotype) but structure not elucidated; no visible ornamentation; length (incomplete?) = 0.41 mm. Spermathecae 4 pairs; diverticulum (inseminated) single, clavate, uniloculate.

MATERIAL EXAMINED.

Lake Pedder, sorted from interstitial fauna, 146°10'E. 42°55'S. Map, 13/2, Mr D. Tyler, 25 Feb 1971 – holotype TM: K311.

REMARKS. The absence of dorsal pores, which is unique in the genus in Tasmania, and the reduction of the anterior nephridia are elsewhere correlated with an aquatic existence in megadriles.

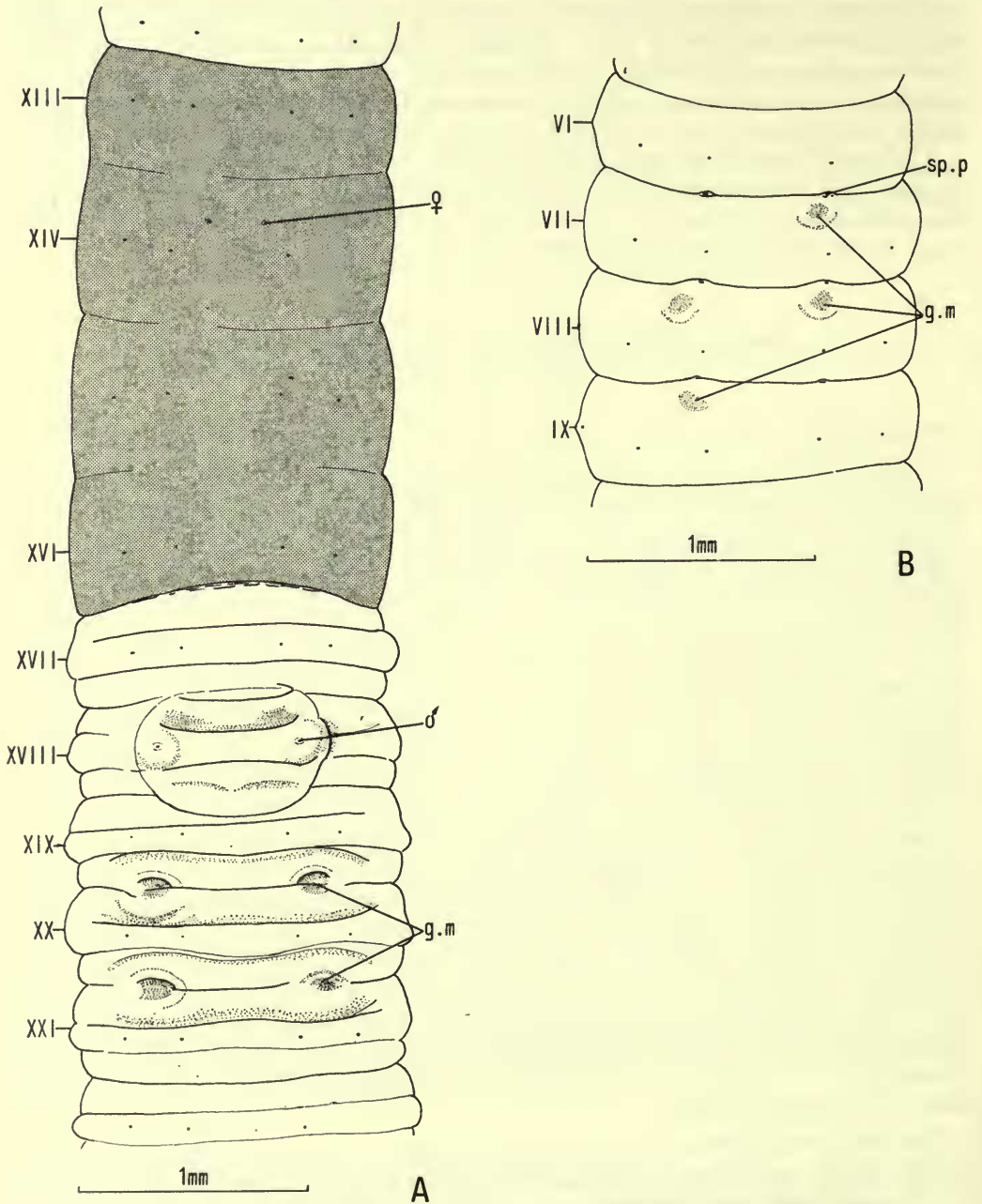


FIG. 14. Genital fields. *Perionychella (Vesiculodrilus) tunnackensis*, holotype : A, male field ; B, spermathecal field.

Perionychella (Vesiculodrilus) tunnackensis sp. n.

Fig. 1, 14A, B, 16X. Table 2

l = 33, 35 mm, w = 1.4, 1.3 mm, s = 82, 81.

Prostomium faintly canaliculate, epilobous $\frac{1}{2}$. First dorsal pore 4/5. Setae 8 per segment in regular longitudinal rows throughout. Nephropores in *c*. Clitellum annular, 13-16. Male pores in *ab* on small papillae on 18, the two papillae joined by a low median ridge, intersegmental ridges at 17/18 and 18/19 flank the male papillae and correspond in extent to the ridge between the papillae. Paired eye-like transversely conjoined genital markings in *ab* at 19/20 (holotype, paratype) and 20/21 (holotype); post-setal eye-like markings occur with centres in *a* in VII (paired in paratype; left only in holotype); VIII (paired) and IX (paired in paratype 1; right only in holotype). Female pores a pair anteromedian of *a* on XIV. Spermathecal pores 3 pairs in *a* at 6/7, 7/8 and 8/9.

Last hearts in XII (latero-oesophageal). Supra-oesophageal not distinguishable from the well-developed oesophageal plexus. Gizzard in V, moderate to small, muscular but easily compressible. Calciferous glands absent. Oesophagus with circumferential vascular striae in (VII ?), VIII-XV; in X-XV with at first few and small, posteriorly increasingly numerous and larger longitudinal rugae which in XIV and XV approach the appearance of laminae. Intestinal origin XVII; typhlosole absent. Nephridia simple stomate, vesiculate holonephridia, commencing in II (funnels traced at least from IV); bladders subspherical, tapering to the pore; large in all but a few anteriormost segments. Holandric (funnels iridescent in X and XI); gymnorchous; seminal vesicles racemose in IX (?) and XII. Metagynous; ovisacs large, in XIV. Prostates depressed tubular with incised adpressed coils, in XVIII-XX; vas deferens joining the gland shortly ental to the muscular duct. Penial setae (holotype) filiform; tip pointed and slightly upturned; no ornamentation; length = 0.76 mm. Spermathecae 3 pairs, decreasing in size anteriorly; diverticulum (uninseminated) single, clavate uniloculate.

MATERIAL EXAMINED.

Tunnack, under logs and stones, damp conditions, 147°30'E. 42°25'S. Map, 14/2, Dr J. L. Hickman, 18 Aug 1954 - holotype TM: K312; paratype BM(NH): 1972.8.32.

REMARKS. As in all Tasmanian species of the genus, the genital markings of this species are distinctive. It is closest to *P. (V.) hobartensis* from which the 3 pairs of spermathecal pores are an additional distinction.

Perionychella (subgenus ?) *bassana* (Spencer, 1895)

Megascolides bassanus Spencer, 1895: 46-47, Pl. III, fig. 34-36.

Plutellus bassanus; Michaelsen, 1900: 169; Jamieson, 1971c: 87.

l = 88 mm, w > 3 mm, s ?.

Prostomium prolobous. First dorsal pore in 4/5 (?). Setae 8 per segment. Nephropores in *c* lines. Clitellum saddle-shaped, embracing XIV-XIX, ventral

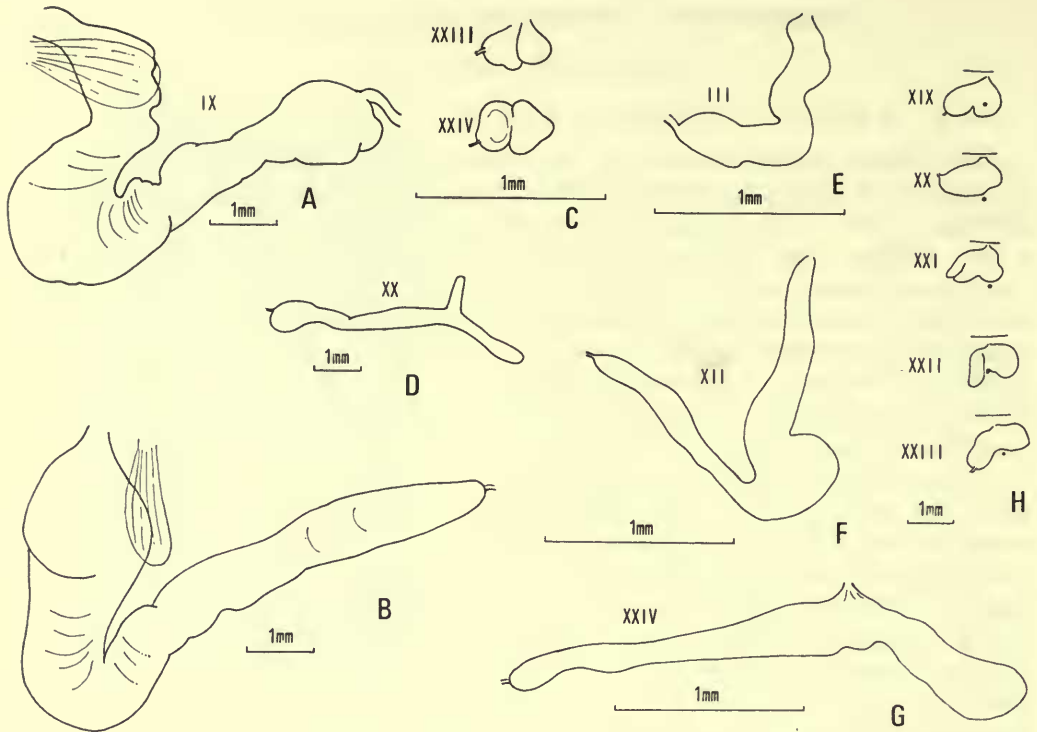


FIG. 15. Nephridial bladders in *Perionychella*. A & B, *Perionychella (Vesiculodrilus) hobartensis*: A, anterior segments; B, an intestinal segment. C, *P. (V.) evansi*, holotype, D, *P. (V.) glandifera*, holotype. E-G, *P. (V.) mortoni*, 14/4, BM(NH): 1972.8.18. H, *P. (V.) montisarihuri*, holotype, *in situ*, showing setae *c.* (A & B, left bladders; others, right bladders.)

margins in *ab* excepting the anterior part of XIV, the whole of which is included. Male pores on papillae in XVIII in *a* lines. Accessory genital markings: a median ventral patch on each of XVII and XVIII; and 2 papillae in XIX in *a* lines, conjoined by a median transverse ridge. Female pores on XIV within the tumid annular part of the clitellum near the midventral line. Spermathecal pores 2 pairs, in 7/8 and 8/9, in *ab*.

Dorsal blood vessel single; last hearts in XIII; no continuous supra-oesophageal. Gizzard in V. True calciferous glands absent but vascular swellings in XIII and XIV; intestinal origin in XIX. Nephridia stomate holonephridia. Holandric?, sperm funnels in X and XI. Seminal vesicles on anterior walls of X (?), XI and XII. Metagynous; ovisacs?. Prostates tubular, small and coiled, in XVIII. Spermathecae 2 pairs, in VIII and IX; the diverticulum simple and less than half the length of the sac.

TYPE-LOCALITY. King Island in Bass Strait.

MATERIAL EXAMINED.

None. The types are missing from the National Museum of Victoria.

REMARKS. It is not entirely certain that this species should be assigned to *Perionychella*. The saddle-shaped clitellum is exceptional, and presence or absence of a typhlosole is not recorded, but otherwise nothing in the brief description excludes it from the genus.

Perionychella (subgenus ?) *decatheca* (Michaelsen, 1910)

Plutellus decatheca Michaelsen, 1910 : 81-83, Fig. XIV-XVI ; Jamieson, 1971c : 87.

l = 100 mm, w = 10 mm, s = 164.

Prostomium epilobous $\frac{1}{3}$, closed. First dorsal pore in 4/5. Setae widely paired ; in the forebody $aa : ab : bc : cd : dd = 1.5 : 1 : 2 : 1.5 : 4.5$; $dd = 0.6u$; in the hindbody $1.5 : 1 : 1.3 : 1 : 2.5$; $dd = 0.25u$. Clitellum annular, XIV-XVIII. Male pores on small papillae in XVIII, approximately in *ab*. Accessory genital markings : paired transverse almost linear papillae anterior and posterior to the male papillae, in XVII, XIX, XX and XXI extending medianly over *a* lines and laterally over *b* lines ; the markings on XVII much larger than those of XIX-XXI, almost contiguous medianly and nearly obscuring the male papillae. Female pores indicated by a long transverse furrow anteriorly in XIV. Spermathecal pores 5 pairs, in 4/5-8/9, in *a* lines.

Dorsal blood vessel single ; last hearts in XIII. A large gizzard in V. Calciferous glands absent ; oesophagus in XIV and XV appearing more vascular than elsewhere, but only slightly swollen. Holonephric. Holandric ; seminal vesicles racemose in IX and XII. Prostates tubular ; duct short and thin. Penial setae ca. 1.2 mm long, and 18 μ m thick, almost straight, proximally slightly curved, distally only slightly tapered. Distal tip rather stout, bent into a small hook. Distal end of the seta ornamented with wide deep teeth, which project very steeply from the seta ; the teeth lying in 4 fairly regular spirally arranged lines. Spermathecae with single, clavate, uniloculate diverticulum.

TYPE-LOCALITY. The vicinity of Hobart.

MATERIAL EXAMINED.

None.

REMARKS. Michaelsen considered *P. decatheca* to be close to *P. insularis* (Spencer, 1895) which is now a junior synonym of *P. hobartensis*. Possibly *decatheca* is merely a variant of the sympatric *hobartensis* but differences from the latter, *viz.* setal rather than intersetal accessory genital markings and the form of the penial setae preclude union of the two taxa on present information. Location of the genital markings anteriorly rather than posteriorly in their segments and apparently the form of the penial setae exclude *decatheca* from the similarly sympatric and not dissimilar *P. mortoni*. Known only from the holotype.

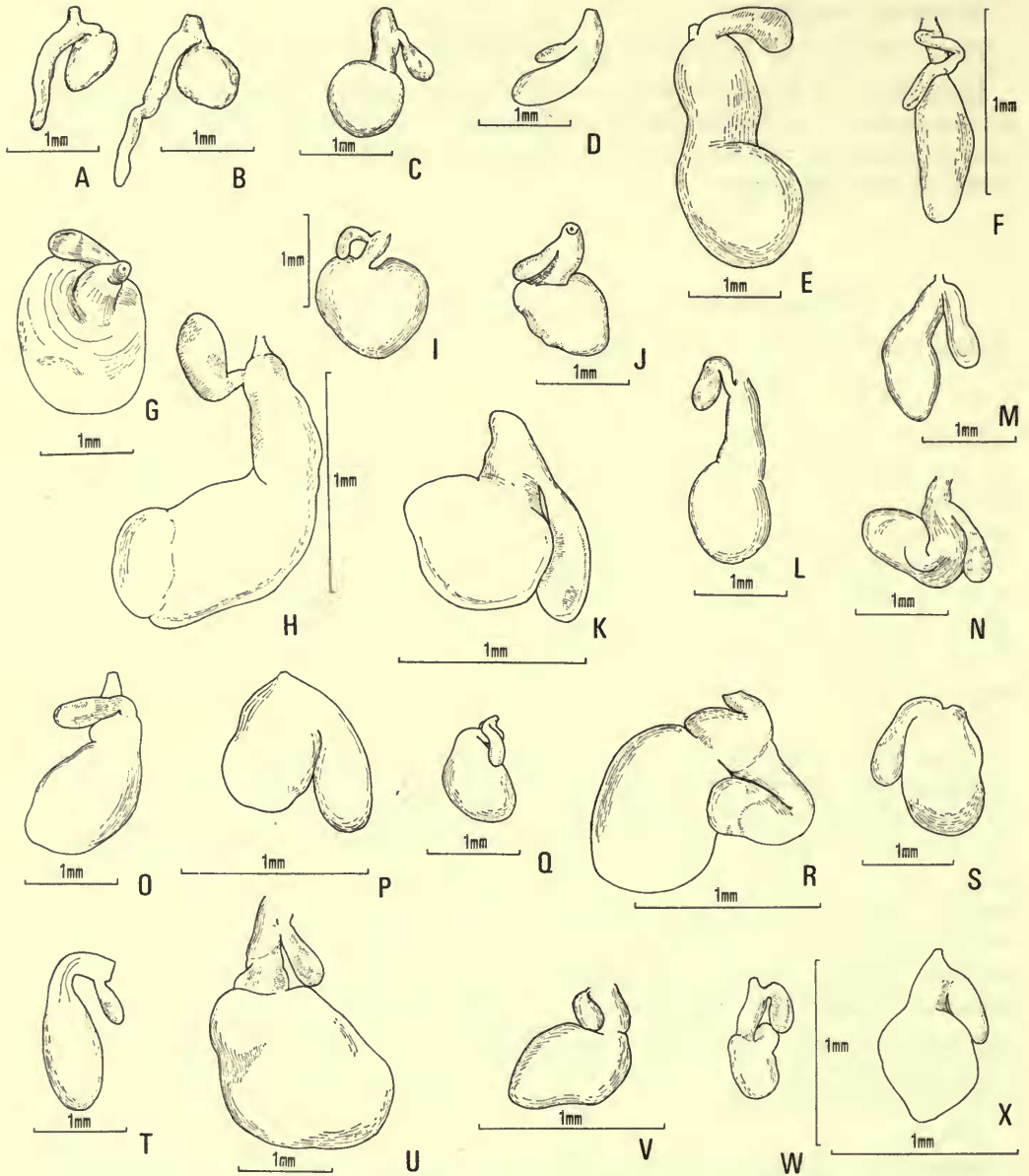


FIG. 16. Spermathecae in *Perionychella*. A & B, *Perionychella (P.) capensis*: A, holotype (left IX); B, paratype 1 (left IX). C & D, *P. (P.) hickmani*: C, holotype (right IX); D, paratype 3 (right VIII). E, *P. (P.) kershawi*, holotype (right VIII). F, *P. (P.) weldboroughi*, holotype (right IX). G, *P. (P.) irregularis*, lectotype (left IX). H, *P. (V.) bithecata*, holotype (left IX). I, *P. (V.) lacustris*, TM: K265 (left IX). J, *P. (V.) dilwynnia*, 13/4, TM: K266 (right IX). K, *P. (V.) evansi*, holotype (right IX). L & M, *P. (V.) glandifera*: L, holotype (left IX); M, paratype (right IX). N & O, *P. (V.) hellyeri*: N, paratype 2 (right IX); O, holotype (right VIII). P-R, *P. (V.) hobartensis*:

Perionychella (subgenus ?) *ellisi* (Spencer, 1895)

Fig. 1.

Cryptodrilus ellisii (sic) Spencer, 1895 : 42-43, Pl. 2, fig. 22-24.
Plutellus ellisi; Michaelsen, 1900 : 172; Jamieson, 1971c : 87.

l = 25-38 mm, w = 3 mm, s ?.

Prostomium epilobous $\frac{1}{2}$, it and the body canaliculate. First dorsal pore in 5/6. Setae 8 per segment throughout; $bc \doteq cd \doteq dd$. Clitellum annular, XIV-XVI or posterior XIII also. Male pores in XVIII in *b* or perhaps slightly ventral of this, on papillae. Accessory genital markings: paired elliptical patches in *ab* anteriorly in X and XI; in 17/18 and 18/19 and anteriorly in XX and XXI. Female pores anteromedian of setae *a* of XIV. Spermathecal pores 3 pairs, in 6/7-8/9, in *b* lines. Last hearts in XII. Gizzard in V. Sessile paired dorsolateral calciferous glands in XIV and XV. Intestinal origin in XVII. Holonephric. Holandric; seminal vesicles racemose, in IX and XII. Prostates tubular, coiled, in XVII-XX. Metagynous; ovisacs in XIV. Spermathecae 3 pairs; diverticulum short, simple.

TYPE-LOCALITY. Dee Bridge, under logs and stones, 146°35'E. 42°15'S. Map, I3/7.

MATERIAL EXAMINED.

The four syntypes (NMV : G32) were found to be in poor condition and no longer yield useful information.

Perionychella (subgenus ?) *moreoa* (Spencer, 1895)

Fig. 1.

Perichaeta moreoa Spencer, 1895 : 49, Pl. IV, fig. 40-42.
Diporochaeta moreoa; Michaelsen, 1900 : 207; Jamieson, 1971c : 83.

l = 100 mm, w ?, s ?.

Prostomium very slightly epilobous. First dorsal pore in 3/4. Preclitellar setae 11-18 on each side; intraclitellar and postclitellar setae 21 per side; dorsal and ventral breaks very small. Nephropores in setal lines 9 or 10 in the midbody. Clitellum? Male pores on papillae between setal lines 3 and 4. Accessory genital markings: median ventral ridge on XVIII between the male papillae; a pair of elliptical patches in *ab*, in 19/20 (or 18/19?). Female pores on XIV. Spermathecal pores 2 pairs, in 7/8 and 8/9, in *ab*.

Last hearts in XII; supra-oesophageal present. Gizzard in V. True calciferous glands absent. Intestinal origin XVII. Holandric; seminal vesicles racemose, in

P, lectotype (right IX); Q, 14/1, TM : K294 (right IX); R, 14/6, BM(NH) : 1972.8.15 (right IX). S, *P. (V.) montisarthuri*, holotype (right IX). T, *P. (V.) mortoni*, 14/4, BM(NH) : 1972.8.18 (right IX). U & V, *P. (V.) obliquae*: U, holotype (right IX); V, 17/1, AM : W5202 (right IX). W, *P. (V.) pedderensis*, holotype (right VIII). X, *P. (V.) tunnackensis*, holotype (right IX).

IX and XII. Metagynous. Ovisacs absent? Prostates in XVII-XX. Spermathecae 2 pairs; diverticulum simple.

TYPE-LOCALITY. Lake St Clair, 146°10'E. 42°05'S. Map, 13/5.

MATERIAL EXAMINED.

The single type-specimen (NMV : G292) is in a very refractory condition and yields no useful information.

REMARKS. There is a discrepancy in Spencer's account: genital markings are paired in 19/20 according to the text but in 18/19 in the illustration. If the markings were in 19/20 there is a possibility that *P. (P.) capensis* (from Table Cape) is a junior synonym. Both species are perichaetine. Differences from *capensis* indicated by Spencer's account are location of the spermathecal pores in *ab* (not *c*), absence of accessory genital markings in 17/18 and intestinal origin in XVII (not ½XVI). These differences, if real, appear to warrant specific distinction of *capensis* but confirmation of the distinctness of the two entities must await collection of new material of *moroea*.

P. (V.) evansi from the same locality as *moroea* has, like the latter and *capensis*, 2 pairs of spermathecae. It differs from *moroea* in having lumbricine setae, in the genital fields and in other respects and conspecificity is not indicated.

Perionychella (subgenus ?) *richea* (Spencer, 1895)

Fig. 1.

Perichaeta richae Spencer, 1895 : 49-52, Pl. V, fig. 49-51.
Diporochoeta richae; Jamieson, 1971c : 83.

l = 75 mm, w = 3 mm, s ?.

Epilobous ½. First dorsal pore in 3/4. Setae 12 on each side anterior to clitellum, 24 half-way along the body. Clitellum annular, XIV-XVII. Male pores on papillae in *ab*. No accessory genital markings developed. Female pores on XIV. Spermathecal pores 5 pairs, on small elliptical patches at the posterior margins of IV-IX, in *a*.

Last hearts in XII; supra-oesophageal in IX-XII. Gizzards in III and IV (?). No true calciferous glands but oesophagus in XI and XII white and swollen. Intestinal origin XVII. Holonephric. Holandric; seminal vesicles racemose, in IX and XII. Metagynous; ovisacs in XIV. Prostates wide, tubular, in XVII-XIX. Spermathecae 5 pairs; the diverticulum very small.

TYPE-LOCALITY. Mount Olympus, under logs in the Beech forest, 146°10'E. 42°05'S. Map, 13/5.

MATERIAL EXAMINED.

None available.

REMARKS. Reported location of gizzards in III and IV, if accurate, would be highly distinctive but this position is very questionable as it is unknown elsewhere in the suborder Lumbricina. This species must be regarded as a *species dubium* as,

apart from the dubious location of the gizzards, there is nothing distinctive in the description which would permit identification. The types are no longer traceable in the Spencer collection (Jensz and Smith 1969).

Perionychella (subgenus ?) ***scolecoidea*** (Spencer, 1895)

Fig. 1.

Perichaeta scolecoidea Spencer, 1895 : 51-52, Pl. V, fig. 47-51.

Diporochoeta scolecoidea ; Michaelsen, 1900 : 207 ; Jamieson, 1971c : 83.

l = 25-27 mm, w = 5 mm, s = 72-77 (lectotype and 2 paralectotypes).

Form very wide relative to the short length. Prostomium epilobous < $\frac{1}{2}$. First dorsal pore in $\frac{3}{4}$ (Spencer). Setae 35 on each side in IV and caudally ; 40-44 on each side in XX ; no dorsal gap throughout ; some ventral interruption posteriorly but irregular and slight (paralectotype 1). Nephropores and clitellum not visible. Male pores on minute papillae in setal lines 4 in XVIII. Accessory genital markings an indistinct transverse pad extending laterally as far as setal line 6 in each of inter-segments 13/14 and 14/15 (lectotype and paralectotype 1 ; none recorded in the text by Spencer but a median pad illustrated in 19/20). Female pores just in front of setae *b* of XIV. Spermathecal pores 2 pairs, in 7/8 and 8/9, in or slightly lateral of setal lines 3 (lectotype) ; or in s.l. 4 (Spencer).

Dorsal vessel single ; last hearts in XII (confirmation). Supra-oesophageal vessel in VIII-XII (Spencer). Gizzard very large, but not very thick walled, in V (confirmation) ; true calciferous glands absent ; intestinal origin XVIII (Spencer).

Holonephric ; nephridia more coiled in II-V than elsewhere. Holandric ; seminal vesicles racemose, in XII. Metagynous (Spencer). Prostates racemose, depressed and lobed, in XVIII (confirmation from lectotype). Penial setae absent (lectotype). Spermathecae 2 pairs, in VIII and IX, each with 2 very small diverticula at the base of a fair-sized sac (Spencer).

TYPE-LOCALITY. King River Valley, approximately 145°25'E. 42°10'S. Map, 12/1.

MATERIAL EXAMINED.

Lectotype NMV : G290 and 2 paralectotypes, G1422.

REMARKS. The material examined was refractory and yielded little information. The condition of the nephridial ducts was indeterminable.

Genus ***GRALIOPHILUS*** Jamieson, 1971e

DIAGNOSIS. Combined male and prostatic pores a pair on XVIII. Prostates tubular. Setae 8 per segment ; $cd \div 0.7-1.3bc$. Nephridia exonephric, stomate, avesculate holonephridia forming a single series on each side discharging in *c* or *d*

or above these; sometimes replaced in a varying number of anterior segments by coiled or tufted nephridia with anteriorly directed (always buccal?) ducts. Calci-ferous glands and intestinal typhlosole present or absent. Spermathecae 2 or less commonly 3 pairs with extramural diverticula, sometimes with sperm chambers in the walls but never multiloculate.

TYPE-SPECIES. *Graliophilus georgei* Jamieson, 1971e.

DISTRIBUTION. Western Subregion of Australia, South Western faunal province. Eastern Subregion, New South Wales (Mt Kosciusko) ?, Tasmania ?.

REMARKS. The above generic diagnosis is based on Jamieson, 1971e. *Graliophilus* was erected for Western Australian species which previously would have been ascribable to *Plutellus* but clearly were not congeneric with the type-species of that genus nor with species of any other genera erected during progressive revision of *Plutellus*. The two species from New South Wales (*G. montiskosciusko*i and *G. woodi* Jamieson, 1973a), were referred tentatively to *Graliophilus* but the widening of *Perionychella* to include avesciculate and vesiculate, lumbricine and perichaetine species, permits *G. montiskosciusko*i to be placed unequivocally in *Perionychella* as a lumbricine species of the nominate subgenus. *G. woodi* and the Tasmanian species *G. tripapillatus* sp. n. differ from *Perionychella* as currently defined in possessing true typhlosoles. Typhlosoles are present in some Western Australian species of *Graliophilus* and *woodi* and *tripapillatus* have therefore been referred to this genus, with which they conform in general morphology, though the identification is made with considerable hesitation. It must be noted that in another Tasmanian genus, *Cryptodrilus*, typhlosoles may be present or absent in closely related species and that separation of *woodi* and *tripapillatus* from *Perionychella* may, therefore, be unnatural as no other significant features are known to exclude them from the latter genus. Furthermore, *P. (P.) capensis* has a slight dorsal intestinal ridge which might be considered a rudimentary typhlosole.

This difficulty in generic identification of species reflects that fact that distinction of *Graliophilus* from *Perionychella* is rendered uncertain by the emendment of *Perionychella*. While some Western Australian species groups, notably the *strelitzii*-group of *Graliophilus*, are unquestionably distinct from *Perionychella*, the *georgei*-group, containing the type-species of *Graliophilus*, conforms closely in morphology with the emended *Perionychella*. However, in Western Australian *Graliophilus* species the number of spermathecae is less (2 or 3 pairs) than the 5 pairs usual in *Perionychella* (though some species of the latter have 1-4 pairs) and the avesciculate and totally lumbricine condition is constant whereas the combination of these characters is known in no *Perionychella* species from Victoria or New South Wales and in only one, *P. (P.) weldboroughi*, from Tasmania. Wallace (1972) has shown that species since placed by the author in *Perionychella* show only a low phenetic resemblance to *Graliophilus* species when affinity is assessed from large character-sets using computer techniques. It is hoped that analysis of the data will allow diagnosis of each genus from the other without recourse to numerical methods.

In short, the following Tasmanian species referred to *Graliophilus* may be a typhlosole species of *Perionychella* (*Perionychella*).

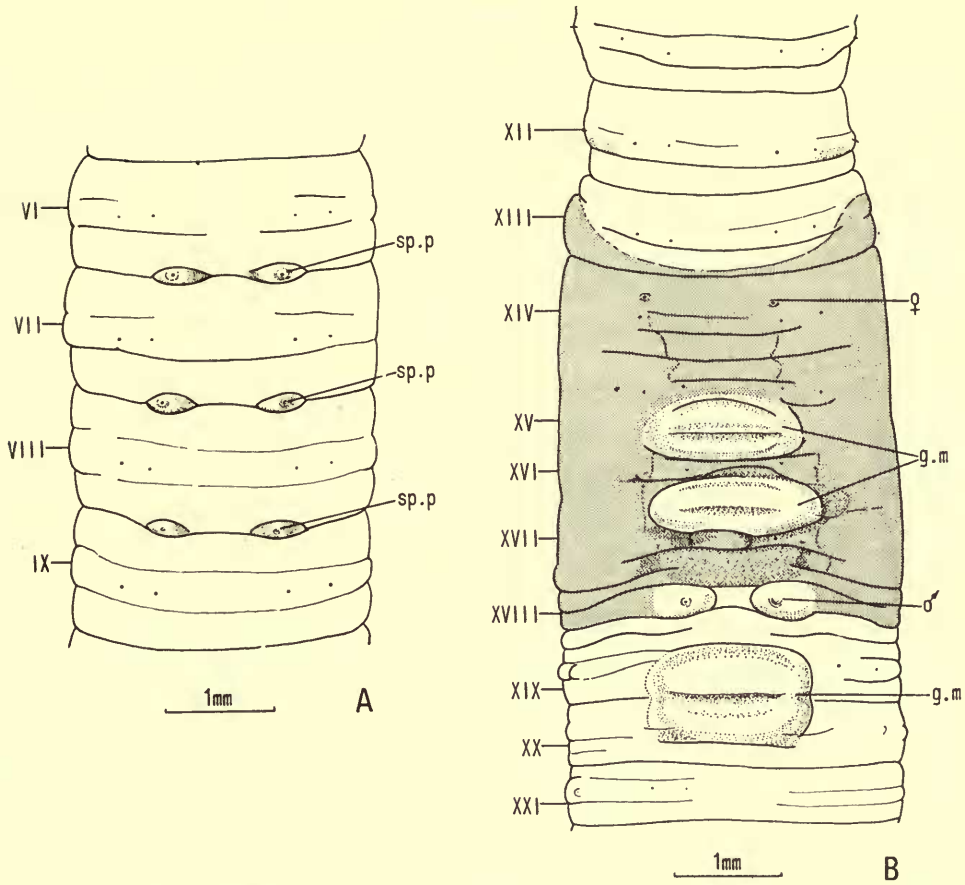


FIG. 17. Genital fields. *Graliophilus tripapillatus*, holotype: A, spermathecal field; B, male field.

Graliophilus (?) *tripapillatus* sp. n.

Fig. 4, 17, 32A; Plate I. Table 3

l = 60, 59 mm, w = 3.2, 3.0 mm, s = 130, 135.

Prostomium epilobous $\frac{1}{3}$, closed. Dorsal pores not visible. Setae 8 per segment, in regular longitudinal rows throughout. Nephropores in *c* lines. Clitellum annular, $\frac{1}{2}$ XIII– $\frac{1}{2}$ XVIII. Male pores on XVIII in *a* on dome-shaped papillae reaching from *b* to an approximately equal distance median to the pores. Accessory genital markings midventral unpaired transverse pads in 15/16, 16/17 and 19/20, extending laterally into *ab* or beyond *b* and longitudinally to or over the setal rows of adjacent segments; the pads increasing in size and prominence posteriorly; faintly indicated glandular and slightly tumid interruptions of the intersegments, in 17/18 and 18/19. Female pores paired on XIV, anterior and only slightly median to setae *a*. Spermathecal pores 3 pairs, in 6/7–8/9, on small papillae in *a*.

TABLE 3

Intersetal distances in segment XII in *Graliophilus tripapillatus*

| | mm | | | | | | | |
|---------------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 0.9 | 0.4 | 1.0 | 0.6 | 3.3 | 0.6 | 1.0 | 0.4 |
| paratype 1 | 0.7 | 0.4 | 0.9 | 0.7 | 2.7 | 0.6 | 0.8 | 0.4 |
| paratype 2 | 1.1 | 0.4 | 1.0 | 0.6 | 3.6 | 0.6 | 1.0 | 0.4 |
| paratype 3 | 1.3 | 0.4 | 1.0 | 0.6 | 3.8 | 0.6 | 1.0 | 0.4 |
| paratype 4 | 1.0 | 0.5 | 0.9 | 0.6 | 2.8 | 0.6 | 0.9 | 0.4 |
| | standardized ($u = 100$) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 11.35 | 4.80 | 11.79 | 7.42 | 49.61 | 7.42 | 11.79 | 4.80 |
| paratype 1 | 10.40 | 4.95 | 12.87 | 9.41 | 38.61 | 7.92 | 10.89 | 4.95 |
| paratype 2 | 12.55 | 4.86 | 11.34 | 6.88 | 41.30 | 6.88 | 11.34 | 4.86 |
| paratype 3 | 13.96 | 4.53 | 11.32 | 6.79 | 40.75 | 6.79 | 11.32 | 4.53 |
| paratype 4 | 12.44 | 5.99 | 11.98 | 8.29 | 36.87 | 7.37 | 11.98 | 5.07 |
| mean | 12.14 | 5.03 | 11.86 | 7.76 | 39.63 | 7.28 | 11.46 | 4.84 |
| interval/ <i>ab</i> | 2.41 | 1.00 | 2.36 | 1.54 | 7.88 | 1.45 | 2.28 | 0.96 |

Last hearts in XII (latero-oesophageal); supra-oesophageal moderately developed in VIII–XIII. Gizzard large and firm in V. Calciferous glands absent; oesophagus internally rugose and with circumferential vascular striae in VIII–XVI. Intestinal origin XVIII; deep dorsal typhlosole commencing in XX. Nephridia simple stomate, avesculate, exonephric holonephridia (funnels demonstrated in fore- and mid-body); ducts entering the parietes presetally in *c* lines, in the forebody forming wide-tubes but not sufficiently dilated to be termed bladders; slender in the midbody.

Holandric (funnels iridescent in X and XI); gymnorchous; seminal vesicles racemose, in IX and XII. Metagynous; ovisacs in XIV. Prostates much coiled, depressed tubular; vas deferens joining the sinuous ectally widening duct shortly ectal of the gland. Penial setae very slender, tip bifid, chelate, the two branches terminally contiguous, a coarse tooth, almost large enough to be considered a bifurcation, on one branch; ornamentation absent; length ? mm, general width of shaft = 3 μ m (holotype). Spermathecae 3 pairs; diverticulum (inseminated) single, clavate, uniloculate.

Genital markings. Of the 15 type-specimens (holotype, paratypes 1–14) only the holotype and paratype 1 have the genital marking in 15/16. Otherwise the genital fields are invariable in all specimens, with median genital marking in each of inter-segments 16/17 and 19/20 and, less strongly indicated, in 17/18 and 18/19.

MATERIAL EXAMINED.

Tarraleah, over pipeline, 146°25'E. 42°20'S. Map, 13/4, Dr J. L. Hickman, 27 May 1954 – holotype TM: K313; paratypes 2–6 TM: K314–318; paratypes 1, 7–9 BM(NH): 1973.2.1–4; paratypes 10–12 AM: W5203–5205; paratypes 13 and 14 BJ: T23–24.

REMARKS. The genital field, with its arrangement of three genital markings, diagnoses this species.

Genus *PINGUIDRILUS* gen. nov.

DIAGNOSIS. Setae 8 per segment. Combined male and prostatic pores a pair on XVIII. Prostates a single pair, tubular. Gizzard in V and VI; extramural calciferous glands and intestinal typhlosole absent. *Nephridia vesiculate holonephridia discharging irregularly in c to near middorsum. Spermathecae adiverticulate.*

DESCRIPTION. Large; terrestrial. Dorsal pores present. Setae 8 per segment. Nephropores erratically in *c* to near the middorsal line. Clitellum long (> 9 segments), including the male pores. Male pores (combined pores of the vasa deferentia and the single pair of prostates) on XVIII. Female pores paired on XIV. Spermathecal pores 5 pairs, the last in 8/9. Accessory genital markings present in the vicinity of the male pores.

Last hearts in XIII, latero-oesophageal hearts, in X–XIII, with connectives to dorsal and the supra-oesophageal vessel. Gizzard large, in V–VI. Extramural calciferous glands absent; intestinal origin XIX; typhlosole absent. Nephridia simple, exonephric holonephridia with large ectal bladders. Holandric; gymnorchous; seminal vesicles in IX and XII. Metagynous; ovisacs absent. Prostates slightly lobulated tubes. Penial setae absent. Spermathecae lacking diverticula.

DISTRIBUTION. Tasmania. (Monotypic.)

TYPE-SPECIES. *Notoscolex tasmanianus* Fletcher, 1888b.

REMARKS. *Pinguidrilus* retains the primitive holonephric condition (two nephridia per segment) seen elsewhere in Tasmania only in *Rhododrilus* (Acanthodrilinae) and in *Perionychella* and a doubtful member of each of the genera *Graliophilus* and *Woodwardiella* (Megascolecinae). The italicized features in the above diagnosis distinguish it from all these genera. Its closest phyletic relationship is presumably with the similarly vesiculate *Perionychella* (*Vesiculodrilus*) but the absence of spermathecal diverticula is a very rare condition in the Megascolecidae (with the exception of the Ocnodrilinae, in which diverticula are only exceptionally present) and, with the unusual arrangement of the nephropores, suggests a rather isolated position for the genus. This irregular disposition of the nephropores is also seen in the Nearctic pluteloid genus *Argilophilus*, which shows strong morphological affinities with *Pinguidrilus*, though avesciculate and possessing spermathecal diverticula albeit little more than sperm chambers in the wall of the spermathecal duct.

Pinguidrilus tasmanianus (Fletcher, 1888b)

Fig. 4, 25B, 32B

Notoscolex tasmanianus Fletcher, 1888b: 607–611.

Megascolides tasmanianus; Spencer, 1895: 33.

Plutellus tasmanianus; Michaelsen, 1900: 175; Jamieson, 1971c: 88.

l = ?, w = 23 mm, s = ?.

Circular in cross section, segments I and II simple; thereafter, in the forebody, strongly triannulate. Prostomium epilobous, closed, $\frac{1}{2}$; it and the peristomium

with numerous longitudinal grooves. First dorsal pore in 10/11, minute. Setae 8 per segment but *c* and *d* only sporadically visible; setae *a* and *b* absent in XVIII. Nephropores (see nephridia, below). Clitellum annular, strongly protuberant, embracing XIV- $\frac{1}{3}$ XXIII; dorsal pores absent, intersegmental furrows retained only ventrally; ventral setal couples visible; nephropores not visible. Male pores distinct but minute apertures in *ab* on small white papillae which occupy the setal annulus of XVIII. Genital markings 7 median transverse pads, in intersegmental furrows 14/15-20/21, each bisected by the furrow, longitudinally occupying the posterior and anterior annuli of the adjacent segments, and extending laterally beyond setal lines *b*; those in 17/18 and 18/19 not as extensive transversely as the others and only shortly overreaching *b* lines. Female pores a pair of minute orifices on small, low papillae, on XIV, very shortly anteromedian of setae *a*, on the setal annulus. Spermathecal pores on 5 pairs of small, round papillae, in 4/5-8/9, in *a* lines.

Septa progressively thickened from 3/4 to 12/13; 3/4 and 4/5 obscured by tendons running to the next posterior septa; 5/6 strong; 12/13 immensely thick; 13/14 moderately thick; the remainder thin. Dorsal blood vessel single; continuous onto the pharynx. Dorsoventral commissural vessels in V-XIII; those in X-XIII forming 4 pairs of latero-oesophageal hearts; those in IX anteriorly progressively more slender and dorsoventral only. Each latero-oesophageal heart receiving a slender connective from the dorsal vessel and a thicker connective from the median supra-oesophageal vessel immediately behind the junction with the latter of a pair of vessels from the oesophageal wall. Supra-oesophageal beginning (very thin) anteriorly in VIII and ending posteriorly as the connectives to the hearts in XIII, the vessel well defined and separate from the oesophagus throughout and posteriorly almost as thick as the dorsal vessel; receiving vessels from the oesophagus throughout its course. Gizzard large and muscular but fairly easily compressible, in V and VI, septum 5/6 being inserted on its equator where the commissures of V join the dorsal vessel. Oesophagus in VII long; coiled and muscular; in VIII-XI vascular, though not conspicuously, and not dilated; in XII and XIII segmentally dilated and with numerous circumferential vascular striae; in XIV-XVIII very wide, extremely thin walled and vascular, giving paired vessels directly to the dorsal vessel. Intestine commencing in XIX; no typhlosole detectable.

Nephridia: nephropores erratically positioned (described by Fletcher as an irregularly sinuous series varying from *c* lines to near the middorsal line); their position sometimes corresponds with setal loci but these also are erratic. In the intestinal region nephridia are stomate, vesiculate holonephridia without supplementary loops; vesicles are large, in two wide sections with a narrow section between; a slight angular projection which could be regarded as a diverticulum extends laterally beyond the position of opening; no change in structure occurs at the hind end; anteriorly nephridial structure is similar but the vesicle is not distinctly divided into two parts (Wallace, personal communication). Testes? sperm masses and large funnels free in X and XI. Seminal vesicles large and racemose in IX and XII; approximately equisized. Ovaries paddle-shaped, with many rows of minute oocytes, and small funnels in XIII. Prostates restricted to XVIII, slender tortuous tubes with slightly lobulated surfaces; the slender ducts receiving the vasa

deferentia near the junction with the glandular portions. Penial setae absent. Spermathecae 5 pairs of simple pouches tapering to the pores but lacking distinctly differentiated ducts; diverticula absent.

TYPE-LOCALITY. Thomas' Plains, N.E. Tasmania.

MATERIAL EXAMINED.

A single fragmenting clitellate specimen labelled 'Megascolides tasmanicus [*sic*] Fletcher jar 2', Baldwin Spencer collection, ex Melbourne University Zoology Department, May 1968.

REMARKS. The above description agrees closely with that of Fletcher and, as the material of Fletcher species in the Baldwin Spencer collection must be considered type material, the specimen examined is here designated the lectotype NMV : G2112. The following additional data are given by Fletcher: lengths (contracted) 200–250 mm, width 19–24 mm; about 200 segments. Setal lines d sinuous; $aa : ab : bc : cd = 4 : 2 : 4 : 3-8$. The first dorsal pore was observed in 12/13, and the clitellum on $\frac{1}{2}$ XIII–XXII; the gizzard in V; the oesophagus dilated and vascular in VIII–XVI and especially in XIII–XVI, showing effervescence in acid in all but the first segment.

Genus **WOODWARDIELLA** Stephenson, 1925

DIAGNOSIS. Combined male and prostatic pores a pair on XVIII. Prostates racemose. Setae 8 per segment; $cd \doteq$ or slightly $> bc$. Nephridia exonephric, stomate, avesiculate holonephridia forming a single series on each side in c lines but (always?) replaced in anterior segments by tufts discharging into the buccal cavity or exonephrically in d lines. Calciferous glands absent; typhlosole weakly developed or absent. Spermathecae 2 pairs, diverticulum simple, not multiloculate. (Based on Jamieson (1970, 1971e).)

TYPE-SPECIES. *Woodwardia callichaeta* Michaelsen, 1907a.

DISTRIBUTION. South-western Australia. Tasmania? Victoria?

REMARKS. Differences between *Woodwardiella* and the older genus *Perionychella* require augmentation. The prostates in *Perionychella* are tubular or, if externally racemose, retain an axial lumen whereas those of *Woodwardiella* have a typical *Pheretima*-type prostate with branching internal ducts (Michaelsen, 1916). Although this difference is allowed in *Cryptodrilus*, a genus in which species with the two alternative conditions of the prostates are assignable to the same genus by virtue of the peculiar excretory system which they share, it warrants separation of *Woodwardiella* and *Perionychella* pending further investigation of the former little known genus. Tubular prostates are all that is certainly known to distinguish *Graliophilus* from the older *Woodwardiella* and further investigation of the justification of retaining *Graliophilus* as a separate genus from *Woodwardiella* or *Perionychella* is also required.

The following Tasmanian species was transferred to *Woodwardiella* by Jamieson (1971c) from the artificial congeries *Plutellus*, in which Michaelsen (1900) had placed it on the then justified grounds that it had 8 setae per segment, holonephridia and apparently racemose prostates. As no material of it is available for the present

study it is retained in *Woodwardiella* though it appears likely that its prostates will be found to be tubulo-racemose and that it will be assignable to *Perionychella*.

Woodwardiella ? *tesselatus* (Spencer, 1895)

Fig. 4

Cryptodrilus tesselatus (sic) Spencer, 1896 : 40-41, Pl. II, fig. 16-18.

Plutellus tesselatus ; Michaelsen, 1900 : 170-171.

Woodwardiella ? *tesselatus* ; Jamieson, 1971c : 92.

l = 25 mm, s = 65.

Prostomium slightly epilobous. First dorsal pore in 5/6. Setae 8 per segment, the dorsal row very irregular and setae *d* absent in some segments ; *c* regular except caudally. Clitellum annular, XIII-XVII, with midventral continuation in *bb* in XVIII and XIX. Male pores on small papillae in XVIII, in *ab*. Accessory genital markings 2 pairs of small elliptical patches in 12/13 and 13/14 in *ab*. Female pores anteromedian to setae *a*, at $\frac{1}{3}aa$, in XIV. Spermathecal pores 2 pairs, in 7/8 and 8/9, in *ab*.

Last hearts in XII. Gizzard in V ; true calciferous glands absent ; intestinal origin XVII. Holonephric. Holandric ; seminal vesicles saccular, in XII. Metagynous. Prostates small flattened lobes, in XVIII. Spermathecae 2 pairs, in VIII and IX ; diverticulum simple, less than half the length of the ampulla.

TYPE-LOCALITY. Mount Olympus, Lake St Clair, in damp soil under logs, and amongst decaying leaves in beech forest. Map, 13/5.

MATERIAL EXAMINED.

None available.

Genus *CRYPTODRILUS* Fletcher, 1887a emend.

DIAGNOSIS. A pair of combined male and prostatic pores on the seventeenth setigerous segment, normally XVIII. Setae 8 per segment. Meronephric ; nephridia typically vesiculate, frequently avesciculate, throughout, not very numerous on each side, some or all discharging in the setal lines ; the medianmost nephridium usually (always ?) with preseptal funnel. Typhlosole present or absent. Prostates tubular, tubuloracemose, or racemose.

DESCRIPTION. Moderate-sized earthworms with less than 200 segments. Prostomium zygalobous to tanylobous. Dorsal pores present or absent. Setae in 8 regular longitudinal lines, commencing on II (or, *C. mediocris*, on the product of union of the first and second metameres). Ventral setal couples widely paired ($aa \doteq 1.5-3ab$) ; setae of the dorsal couples (*cd*) widely separated, always further apart than those of the ventral couple ($cd \doteq 2-4ab$) and usually a greater interval, sometimes smaller, than the interval between the couples of a side (*bc*) ; dorsal median intersetal distance ($dd \doteq 0.2-0.4$ of the circumference (*u*)). Setae *a* and *b* absent in the segment bearing the male pores ; usually replaced by penial setae. Nephropores (conspicuous or not) at least 3 on each side in some segments and

reaching (*C. polynephricus*) as many as 10 per side ; the pores associated with some or all four of the setal lines where the number per side is 4 or less ; increase in number intersetal and setal. Clitellum annular, commencing in XII–XIV and including or shortly preceding the segment bearing the male pores. A pair of combined male and prostatic pores on XVIII (or XVII where intersegment 1/2 is suppressed), in *b* or median of this. Accessory genital markings present. Female pores a pair, or unpaired midventral, in XIV, inconspicuous, though sometimes in a common glandular field. Spermathecal pores 2 or 3 pairs, the last pair in intersegmental furrow 8/9.

Some preclitellar septa strongly thickened. Gizzard rudimentary to well developed, in V. Definite calciferous glands absent but oesophagus in some segments vascularized, often dilated, and internally rugose or lamellate. Intestinal origin XVI, XVII or XVIII ; typhlosole present or absent. Dorsal blood vessel (always ?) continued onto the pharynx ; dorsoventral commissurals commencing in V or further posteriorly ; last hearts in XII or XIII, those in X–XIII forming latero-oesophageal hearts with connectives from the supra-oesophageal vessel and in some species from the dorsal vessel. Supra-oesophageal vessel not extending more than a segment or two in front of the latero-oesophageal hearts. Subneural vessel absent. Nephridia 3–ca. 15 exonephric nephridia on each side, typically vesiculate but frequently avesiculate, some or all discharging in the setal lines ; the medianmost nephridium in the intestinal or at least caudal region stomate in most if not all species and frequently enlarged as a megameronephridium ; posterior nephridia sometimes sending ducts posteriorly through several segments or sometimes with the stomate nephridia contributing to a longitudinal excretory duct (ureter) which appears to discharge at junction of rectum and body wall ; rarely (*C. enteronephricus*) with duct of each stomate megameronephridium entering the intestine. Avesiculate exonephric or enteronephric tufts present or absent in anterior segments. Holandric ; gymnorchous ; seminal vesicles in 2 or more of segments IX, X, XI and XII. Metagynous ; ovisacs present or absent. Prostates one pair, racemose, with branched internal and external ducts, or tubuloracemose (lobulated but with single central lumen which (always ?) has side branches) ; vasa deferentia joining the ectal end of the gland or the prostate duct shortly ectal of this. Spermathecae discharging anteriorly in their segments ; the duct with one or two uniloculate diverticula.

TYPE-SPECIES. *Cryptodrilus rusticus* Fletcher, 1887a.

DISTRIBUTION. Eastern Subregion of Australia, Southern faunal province : New South Wales and Victoria. Tasmania.

REMARKS. The tribe Perionychini was established by Jamieson (1971a) for those Megascolecinae which were holonephric, or had meronephridia in a varying number of segments anterior to holonephridia, and which lacked intestinal enteronephry. Demonstration of more than two vesiculate nephridia per segment in *Cryptodrilus* (*vide* Jamieson 1972b) posed the problem that this genus could not be placed in any one of the three megascolecine tribes (Perionychini, Dichogastrini and Megascolecini) recognized by the author but studies of general morphology, and a numerical (taxonomic) investigation of setal ratios, suggested that the affinities of *Cryptodrilus* lay with the Perionychini. An evolutionary pathway for origin of the multiple-bladder

condition from the holonephric vesiculate condition exemplified by *Plutellus heteroporus*, the 'heteropore' condition, was suggested. It was pointed out, and is still maintained, that recognition of a tribe Cryptodrilini to include *Cryptodrilus* deserves consideration. In the present work *Cryptodrilus* is included in the Perionychini because of its close morphological and presumed evolutionary links with this tribe, the nephridial bladders, which are unknown in the Dichogastrini and Megascolecini, being an especially significant indication of affinity. Pending the possibility of erection of a tribe Cryptodrilini, then, the definition of the Perionychini must be enlarged to include species with multiple bladders in a segment or, in other words, all megascolecine species with nephridial bladders, irrespective of whether holonephric or meronephric, in addition to holonephric avesiculate species.

Some species of *Cryptodrilus*, which have clear affinities (sometimes at the infra-specific level) with vesiculate species, lack nephridial bladders. They have median stomate nephridia in posterior segments, as do some vesiculate species, and are presumed to represent an acquisition of the dichogastrin condition of nephridia independently of the true Dichogastrini. This view is preferred to the alternative that they represent a survival of populations transitional between the Perionychini and Dichogastrini as the numerical study indicated that, at least in setal ratios, the Dichogastrini are distinct from the Perionychini. This distinctness might have been developed subsequent to origin of Dichogastrini from populations of which Tasmanian perionychines are representative but variation from the vesiculate to the avesiculate condition infraspecifically, or at least in very closely related subgeneric taxa (vide *C. polynephricus*), indicates that loss of vesicles is currently occurring in Tasmanian perionychines. The definition of the Perionychini must, therefore, be further extended to allow inclusion of forms which have acquired the dichogastrin condition but have clear relationships with perionychin species. In addition, an avesiculate species, *C. enteronephricus*, with intestinal enteronephry (a condition formerly restricted to the Megascolecini) which is unquestionably related to vesiculate species of *Cryptodrilus*, must be included within this genus in the Perionychini. Thus the definition of the Perionychini embraces species which would be referable to the Dichogastrini or Megascolecini on the anatomy of the excretory system but which show evident relationships with Perionychini.

Such widening of the definition of discrete groups so that they are no longer totally interdistinguishable has become accepted in modern taxonomy and is an expected extension of the concept of polythetic groups, definable by no one single character.

The genus *Cryptodrilus*, as emended above to include additional evidence from Tasmanian species, has now become a polythetic grouping as the single formerly diagnostic character, multiple nephridial bladders in a segment, no longer applies to all species. Inclusion of avesiculate species appears justified from a consideration of general anatomy. Such a variation, from vesiculate to avesiculate species is insignificant relative to the remarkable variation further discussed in the account of *C. polynephricus*, from the exonephric to the enteronephric condition in posterior segments.

Jamieson (1972a) recognized three species groups in *Cryptodrilus*. The Tasmanian species *C. avesiculatus*, *C. brunyensis*, *C. enteronephricus* and *C. polynephricus* (with

C. albertisi) show clear affinities with the *mediocris* group and *C. simsoni* and less certainly *C. dartnalli* probably also are placeable in it. It is not proposed, however, to redefine the group as the emended definition would be so wide as to be poorly defined from the *rusticus* and *fastigatus* groups and would have little operational value. This is not to deny that at least *fastigatus*, with its externally branched prostates, is a very unusual species. If further species with *fastigatus* prostates were found it would not be unreasonable to recognize a separate genus for such species, the name *Trinephrus* being available for it.

CHECK LIST OF SPECIES OF *Cryptodrilus**Tasmanian species*

- C. albertisi* (Cognetti, 1910) New combination (junior synonym of *C. polynephricus* ?)
C. avesiculatus sp. n.
C. brunyensis sp. n.
C. dartnalli sp. n.
C. enteronephricus sp. n.
C. officeri Spencer, 1895
C. polynephricus Spencer, 1895
C. simsoni Spencer, 1895

Other species

New South Wales

- C. fastigatus* Fletcher, 1889a
C. mediocris Fletcher, 1889a
C. rusticus Fletcher, 1887a
C. tenuis Fletcher, 1889a

Victoria

- C. dubius* Spencer, 1892a (junior synonym of *C. fastigatus*)

KEY TO TASMANIAN SPECIES OF *CRYPTODRILUS**

- | | | |
|---|--|----------------------------------|
| 1 | 3 pairs of spermathecae | <i>C. officeri</i> Spencer, 1895 |
| — | 2 pairs of spermathecae | 2 |
| 2 | Gizzard large, firm. Intestine commencing in XVI | 3 |
| — | Gizzard small, flaccid. Intestine commencing in XVII or XVIII | 6 |
| 3 | Caudally with median stomate nephridium on each side discharging into the intestine. Fig. 20 | <i>C. enteronephricus</i> sp. n. |
| — | No caudal nephridia discharging into the intestine unless anally | 4 |
| 4 | 2 nephridia present caudally in <i>a</i> line on each side: 1 astomate and discharging exonephrically, the other stomate and contributing to a longitudinal collecting duct (ureter) | 5 |
| — | Only one nephridium present caudally in <i>a</i> line on each side, astomate and exonephric. No ureter present. Fig. 18B | <i>C. avesiculatus</i> sp. n. |

*Excluding *C. albertisi* (*q.v.*)

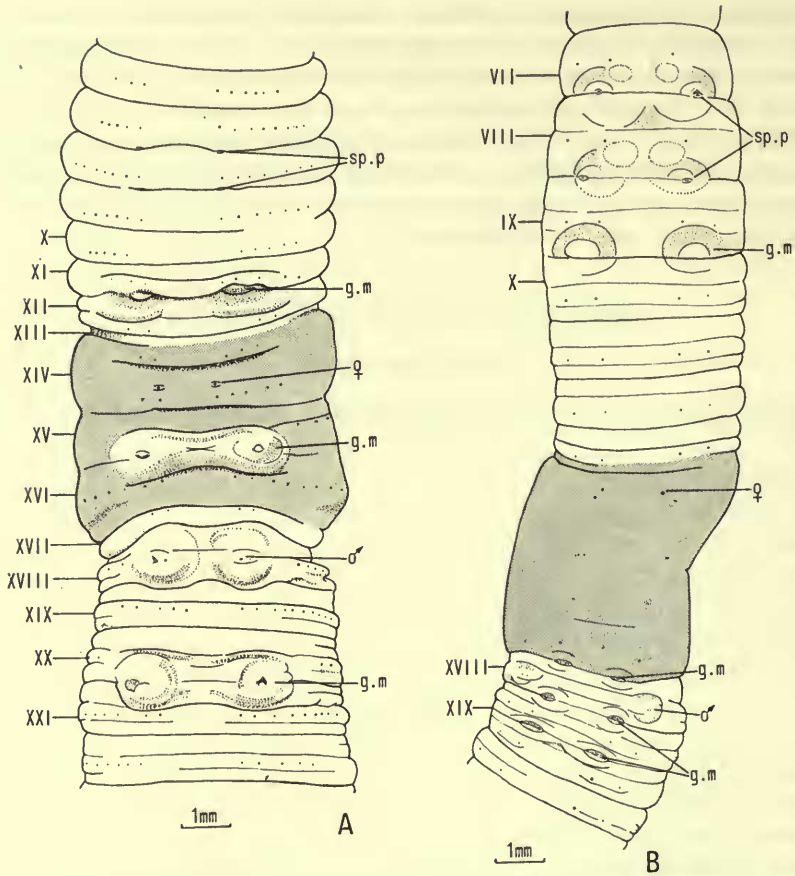


FIG. 18. Genital fields. A, *Hickmaniella opisthogaster*, holotype. B, *Cryptodrilus avesciculatus*, holotype.

- 5 No postsetal genital markings in preclitellar segments. Fig. 19A . *C. brunyensis* sp. n.
 - Postsetal genital markings present in preclitellar segments. Fig. 21A, B, C
C. polynephricus Spencer, 1895
 6 Dorsal pores present. Intestine commencing in XVIII. Fig. 25A *C. simsoni* Spencer, 1895
 - Dorsal pores absent. Intestine commencing in XVII. Fig. 19B . *C. darnalli* sp. n.

Cryptodrilus albertisi (Cognetti, 1910)

Fig. 2

Megascolides albertisi Cognetti, 1910 : 329-331, Fig. 3-6.

l = 68 mm, w = 4 mm, s = 107.

Prostomium tanylobous. Dorsal pores not observed. Ventral setae closely paired, dorsal setae distant, $aa < bc < cd$ throughout. In V-XVIII, $aa = ab + bc$;

$ab > bc$; $cd = 2bc$; $dd = 1.5cd = 0.3u$. Behind XVIII setal lines, with the exception of a , displaced dorsally so that, in XXX, aa slightly $> ab$, but appreciably $< ab + bc$; ab slightly $< bc$; $cd > 2bc$; $dd = aa \doteq 0.14u$. Clitellum not developed. Male pores not externally visible. Accessory genital markings 3 pairs of whitish, slightly tumid papillae posteriorly in segments IX, X and XI in b lines. Female pores a pair anteriorly in XIV, midway between setal lines a and the ventral midline. Spermathecal pores 2 pairs of short transverse slits in 7/8 and 8/9, shortly lateral of a lines.

Last hearts in XIII. Gizzard extending from mid V to mid VI; calciferous glands absent; intestinal origin XVI. Nephridia 'diffuse'; from approximately segment XXX, those of the most ventral pair, in b lines, are much larger than the others. Holandric; gymnorchous; seminal vesicles small, in IX, larger in XII, non-racemose. Prostates one pair, in XVIII-XX, the glandular part oblong with corrugated surface; the S-shaped muscular duct penetrating the parietes in, apparently, b . Penial setae 800 μm long, 30 μm wide, slightly curved, ending in a point which is not very fine; the ectal half ornamented with small scale-like projections with minutely dentate margins. Metagynous. Spermathecae 2 pairs, in VIII and IX; ampulla transversely compressed with slightly lobulated margin with stout duct of equal length into which, a short distance from the external pore, opens a digitiform diverticulum.

TYPE-LOCALITY. Mt Wellington. Map, 14/4.

MATERIAL EXAMINED.

None available.

REMARKS. Cognetti's description is questionably adequate for identification of any material with this species. Although nephridial bladders and distribution of nephridia are not described, the distribution of accessory genital markings strongly suggests that *C. albertisi* is identical with, and therefore, a junior synonym of, *C. polynephricus* Spencer, 1895.

Cryptodrilus avesculatus sp. n.

Fig. 2, 18B, 31A; Plates 2 and 3. Table 4

$l = 81$, 69 mm, $w = 3.8$, 4.0 mm, $s = 116$, 118.

Prostomium epilobous $\frac{2}{3}$, open. Dorsal pores absent. Setae 8 per segment, in regular longitudinal rows throughout. Nephropores not visible. Clitellum annular, $\frac{1}{2}$ XIII-XVII. Male and separate penisetal pores on dome-shaped papillae in b of XVIII. Accessory genital markings 2 or 3 pairs of eyelike markings in 17/18 (holotype), 18/19 and 19/20 (holotype, paratype 1) in a lines; postsetal paired oval markings extending over the posterior borders of their segments in VII and VIII containing the spermathecal pores (holotype) and in IX (holotype, paratype 1); also a faintly indicated paired postsetal patch in and ventral to a in VII and VIII (holotype). Female pores shortly anteromedian to setae a of XIV. Spermathecal pores 2 pairs, in 7/8 and 8/9, on minute papillae in ab .

TABLE 4

Intersetal distances in segment XII in *Cryptodrilus avesiculatus*

| | mm | | | | | | | |
|---------------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 1.6 | 0.7 | 1.4 | 1.5 | 3.5 | 1.5 | 1.4 | 0.7 |
| paratype 3 | 1.1 | 0.6 | 1.2 | 1.4 | 2.4 | 1.4 | 1.1 | 0.6 |
| paratype 4 | 1.1 | 0.6 | 1.1 | 1.3 | 2.3 | 1.3 | 1.0 | 0.6 |
| paratype 5 | 1.4 | 0.6 | 1.1 | 1.3 | 2.1 | 1.3 | 1.0 | 0.6 |
| | standardized ($u = 100$) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 13.07 | 5.68 | 11.36 | 12.50 | 28.69 | 11.93 | 11.36 | 5.40 |
| paratype 3 | 11.33 | 6.37 | 12.04 | 14.51 | 24.43 | 13.81 | 11.33 | 6.02 |
| paratype 4 | 11.97 | 6.73 | 11.22 | 14.21 | 24.68 | 13.46 | 10.85 | 6.73 |
| paratype 5 | 14.96 | 6.36 | 11.59 | 13.84 | 22.44 | 13.84 | 10.47 | 6.36 |
| mean | 12.83 | 6.29 | 11.55 | 13.77 | 25.06 | 13.26 | 11.00 | 6.13 |
| interval/ <i>ab</i> | 2.04 | 1.00 | 1.84 | 2.19 | 3.98 | 2.11 | 1.75 | 0.97 |

Last hearts in XII (latero-oesophageal). Supra-oesophageal present. Gizzard large, in V. Extramural calciferous glands absent but oesophagus vascularized and moniliform in IX–XIII (holotype, paratype 1) and slightly in VIII (paratype 1). Intestinal origin XVI; typhlosole absent. Nephridia (holotype): large (exonephric?) tufts in III and IV; succeeding segments with a few large avesiculate integumentary micromeronephridia on each side. Caudally 4 exonephric, avesiculate nephridia on each side discharging in front of setae *a*, *b*, *c* and *d*; the dorsal three astomate, the medianmost nephridium, discharging in *a* with a large preseptal funnel and greatly enlarged to form a megameronephridium; one nephridium only at the *a* locus, the megameronephridium; no ureter. Holandric (funnels iridescent); gymnorchous; seminal vesicles compact, racemose in IX and XII. Metagynous; ovisacs absent. Prostates flattened, lobulated but linear winding through XVII–XX; with narrow central lumen. Vasa deferentia joining the ectal end of the gland. Penial setae moderately stout, strongly curved, widened basally, the smooth delicate pointed tip upturned; the ectal region of the shaft, with the exception of the vicinity of the tip, ornamented by a series of coarsely serrated, scarcely protuberant transverse but appreciably oblique jagged markings each of which occupies approximately one-quarter to three-quarters of the width of the seta; length of functional seta = 1.3 mm, general width of shaft = 23 μ m (holotype). Spermathecae 2 pairs; diverticulum single, subspherical, in the axis of the duct; ampulla a lateral appendage.

Genital markings. (Holotype, paratypes 1–7.) Genital markings in IX are restricted to the Port Davey specimens. In the new Harbour specimens a distinct oval genital marking is developed in front of each spermathecal pore, on VII and VIII; there are only suggestions of these in the Port Davey specimens. All specimens, from both localities, have paired eye-like marking is 18/19 and 19/20 but only the holotype and paratype 2 have these markings in 17/18 and in only paratype 3 are they present (median to *a*) in 20/21.

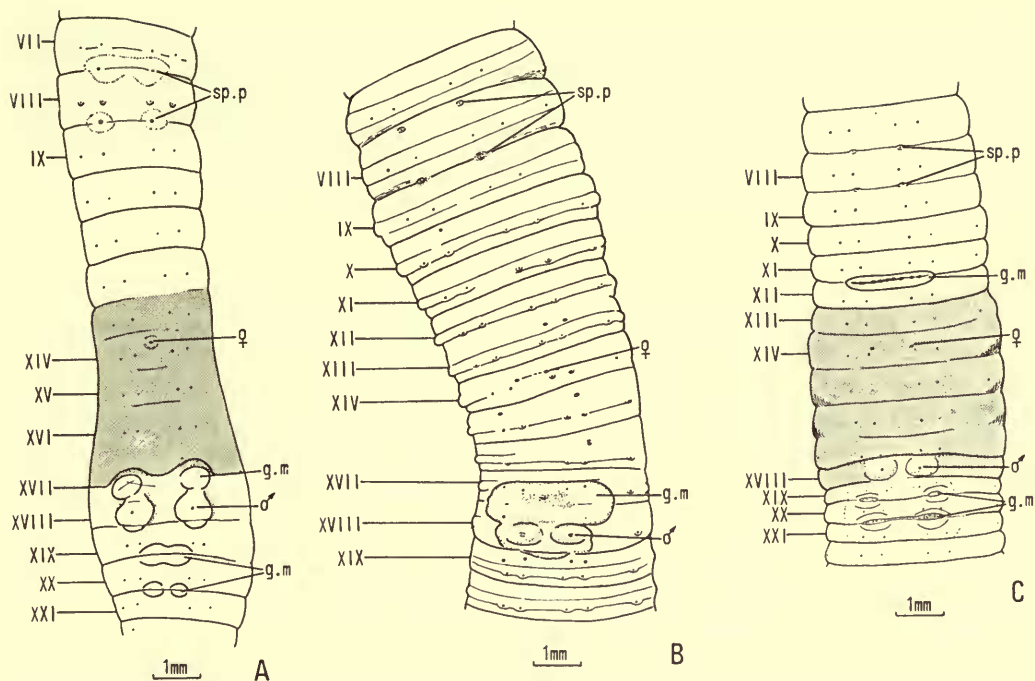


FIG. 19. Genital fields. A, *Cryptodrilus brunyensis*, holotype. B, *C. dartnalli*, holotype. C, *C. simsoni*, 8/1, specimen 2.

MATERIAL EXAMINED.

Kelly's Basin, Port Davey, 145°55'E. 43°20'S. Map, 17/1, Tasmanian Biological Survey: J17, Mr C. D. King, Jan 1940 - holotype TM: K319; paratype 1 BM(NH): 1973.2.5; paratype 2 TM: K320. New Harbour, 146°70'E. 43°30'S. Map, 18/5, Mr C. D. King - paratypes 3 and 4 TM: K321-322; paratypes 5 and 6 AM: W5206-5207; paratype 7 BJ: T25.

REMARKS. *C. avesiculatus* is closely similar to *C. enteronephricus*, *C. polynephricus* or *C. brunyensis*. It differs from *C. enteronephricus* in lacking caudal enteronephry, and from *C. polynephricus* and *C. brunyensis* in lacking a ureter.

Cryptodrilus brunyensis sp. n.

Fig. 2, 19A, 31B, C; Plates 4-7. Table 5

l = 48 mm, 71 mm, w = 3.0 mm, s = 83, 124.

Prostomium epilobous $\frac{1}{2}$, open. Dorsal pores absent. Setae 8 per segment in regular longitudinal rows throughout. Nephropores not visible. Clitellum annular XIII-XVII. Male pores in *ab*, nearer *a*, in XVIII on subcircular papillae which extend posteriorly over 18/19 slightly into XIX and anteriorly reach the hind margins of a pair of oval genital markings in *ab* at 17/18. Two penial setae, projecting from separate follicles, median to each pore. Two additional pairs of genital markings

present in 19/20 and 20/21 median to *a*, the anterior pair fused medianly (holotype) ; only the conjoined pair in 19/20 present in paratype 1. Female pore unpaired, midventral, between the setal arc and anterior margin of XIV. Spermathecal pores 2 pairs, in 7/8 and 8/9, in *a* lines, each surrounded by a glandular field ; the fields in 7/8 (holotype) or in 7/8 and 8/9 (paratype) medianly united and suggestions of presetal markings present in *b* of IX in paratype 1.

TABLE 5

Intersetal distances in segment XII in *Cryptodrilus brunyensis*

| | mm | | | | | | | |
|---------------------|--------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 0.9 | 0.5 | 1.0 | 1.3 | 1.5 | 1.3 | 1.1 | 0.5 |
| paratype 1 | 1.2 | 0.6 | 1.2 | 1.4 | 1.5 | 1.4 | 1.2 | 0.6 |
| | standardized (<i>u</i> = 100) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 11.45 | 6.17 | 12.33 | 15.86 | 18.94 | 15.86 | 13.66 | 5.73 |
| paratype 1 | 13.03 | 6.90 | 12.64 | 15.71 | 16.48 | 15.71 | 12.64 | 6.90 |
| mean | 12.24 | 6.54 | 12.49 | 15.79 | 17.71 | 15.79 | 13.15 | 6.32 |
| interval/ <i>ab</i> | 1.87 | 1.00 | 1.91 | 2.41 | 2.71 | 2.41 | 2.01 | 0.97 |

Dorsal blood vessel continuous onto the pharynx. Last hearts in XII ; hearts in X–XII latero-oesophageal, each with a connective to the supra-oesophageal vessel but none to the dorsal vessel, supra-oesophageal ending at $\frac{1}{2}$ XIII, well developed. Gizzard firm and very large, in V. Calciferous glands absent but oesophagus internally lamellate in VIII–XIII. Intestinal origin XVI ; dorsal typhlosole a low but distinctly developed lamina from XVIII but continued as a rudiment to XVI (holotype, paratype). Nephridia : loose aggregations of nephridia in II and III send several ducts anteriorly to discharge at the anterior margin of the segment ; pharyngeal tufts in IV–VI, accompanied by exonephric meronephridia ; in VII and VIII with a meronephridium discharging above *d*, at *d*, *cd*, *c*, *b* and several, of which some form a small tuft, at *a* ; this condition persisting in succeeding segments (holotype) ; in the hindbody with a micromeronephridium discharging in the 4 setal lines *a*, *b*, *c* and *d* and in addition a stomate megameronephridium contributing its duct to a poorly developed longitudinal collecting duct (ureter) (holotype, paratype) which ends posteriorly at the junction of rectum and body wall and therefore appears to discharge into the anal aperture on each side ; all nephridia avesculate and only the megameronephridia with funnels (holotype). In paratype the ureter is well developed but is not certainly detectable at the caudal extremity where in *a* there is only a single (astomate ?) nephridium ; those in *b*, *c* and *d* persisting.

Holandric (funnels iridescent in X and XI) ; gymnorchous ; seminal vesicles racemose in XI and XII. Metagynous ; ovisacs present. Prostates broad, flattened, linear, lobulated (tubuloracemose), in XVIII–XXI (holotype, paratype), dissected to demonstrate main central internal duct with numerous more slender lateral branches (holotype). Vasa deferentia on each side winding before joining the

prostate duct at its junction with the gland. Penial seta moderately stout, strongly curved, tapering to a narrow blunt or pointed tip; the ectal region of the shaft, with the exception of the vicinity of the tip, ornamented by numerous groups of small, irregular, conjoined teeth, the groups alternating along the seta, each containing only a few teeth but considerably notching the setal surface; length of a functional seta = 1.9 mm; general width of shaft = 20 μ m (paratype 1). Spermathecae (not inseminated) 2 pairs, each with long convoluted duct and long clavate-digitiform diverticulum.

MATERIAL EXAMINED.

Rainforest at summit of Mt Mangana, Bruny Is., 147°15'E. 43°25'S. Map, 19/1, Mr A. J. Dartnall, 10 Apr 1971 - holotype TM: K323; paratype BM(NH): 1973.2.6.

REMARKS. *C. brunyensis* is morphologically close to *C. enteronephricus*, *C. avesiculatus* and *C. polynephricus*. It differs from *C. enteronephricus* in lacking caudal enteronephry, from *C. avesiculatus* in possessing a ureter and from *C. polynephricus* in lacking preclitellar genital markings.

Cryptodrilus dartnalli sp. n.

Fig. 2, 19B, 31D; Plates 8-12. Table 6

l = 85+, 109 mm, w = 3.7, 3.5 mm, s = 107+, 143 (holotype, posterior amputee; paratype 2).

Prostomium epilobous $\frac{1}{2}$, closed, continued posteriorly as parallel grooves, almost giving a tanylobous condition. Dorsal pores absent. Setae 8 per segment, in regular longitudinal rows throughout. Nephropores sporadically visible presetally. Clitellum not developed (holotype) or strongly protuberant, though weak in *aa*, in XIV-XVII with some dorsal clitellar modification to $\frac{1}{2}$ XVIII and perhaps $\frac{1}{2}$ XIII (paratype 2). Male pores small slits on XVIII in *a* on ovoid papillae which extend laterally as far as *b* and well median of *a*. Glandular tumescence extending from setal arc of XVII to shortly behind 18/19, reaching mid *bc* at 17/18, and including the male porophores (holotype), similar in paratype 1 in which a pair of faint eye-like genital markings is present on the tumescence in 17/18 in *b*; indistinctly developed in paratype 2 and other New Harbour specimens and obscured in these by insinking of the male field. Female pores a pair very shortly anteromedian of setae *a* on XIV. Spermathecal pores 2 pairs of small slits on small but distinct papillae, in 7/8 and 8/9, in *a*.

TABLE 6

Intersetal distances in segment XII in *Cryptodrilus dartnalli*
mm

| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| holotype | 1.1 | 0.6 | 1.3 | 1.2 | 4.5 | 1.2 | 1.3 | 0.6 |
| paratype 1 | 1.1 | 0.7 | 1.5 | 1.4 | 4.8 | 1.5 | 1.6 | 0.7 |
| paratype 2 | 1.2 | 0.8 | 1.6 | 1.4 | 5.8 | 1.3 | 1.6 | 0.7 |

Table 6 (cont.)

| | standardized ($u = 100$) | | | | | | | |
|-------------|----------------------------|------|-------|-------|-------|-------|-------|------|
| | aa | ab | bc | cd | dd | dc | cb | ba |
| holotype | 9.15 | 4.88 | 10.98 | 10.37 | 38.41 | 10.37 | 10.98 | 4.88 |
| paratype 1 | 8.59 | 5.37 | 11.28 | 10.20 | 35.98 | 11.28 | 11.81 | 5.37 |
| paratype 2 | 8.16 | 5.28 | 11.04 | 9.60 | 39.60 | 9.12 | 11.04 | 4.80 |
| mean | 8.63 | 5.18 | 11.10 | 10.06 | 38.00 | 10.26 | 11.28 | 5.02 |
| interval/ab | 1.67 | 1.00 | 2.14 | 1.94 | 7.34 | 1.98 | 2.18 | 0.97 |

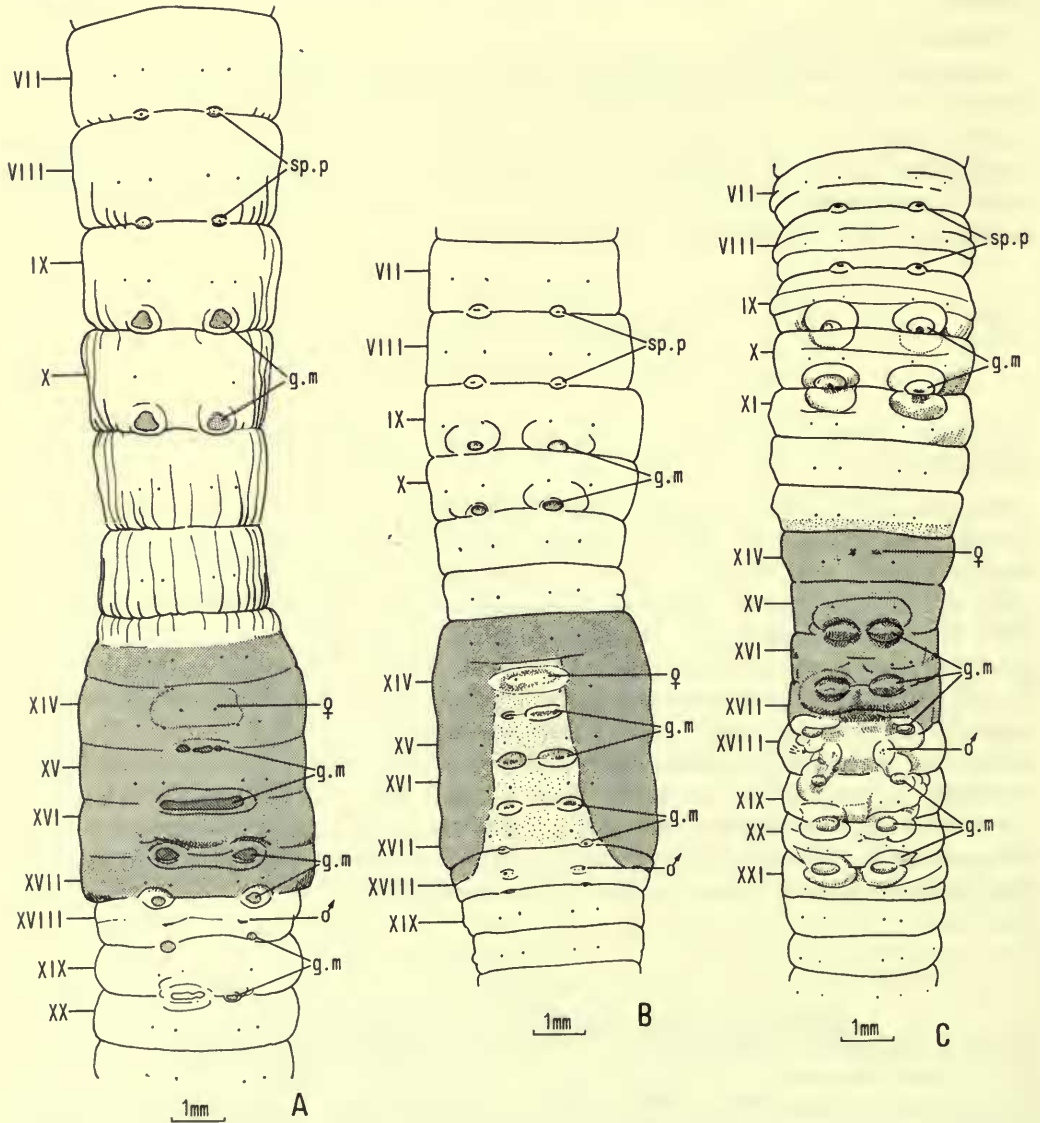


FIG. 20. Genital fields. *Cryptodrilus enteronephricus*: A, holotype; B, paratype 18; C, paratype 3.

Last hearts in XIII (latero-oesophageal ; connectives to dorsal vessel not demonstrable). Supra-oesophageal in VII–XIII, well developed. Gizzard vestigial, in V, but musculature thicker than elsewhere. Extramural calciferous glands absent ; oesophagus with circumferential vascular striae and internal papilliform rugae, in VII–XIII (holotype), XIV (paratype) ; chloragogenous and narrower in XIV (holotype), XV (paratype 2)–XVI, though with internal rugae in XIV in holotype ; intestinal origin XVII ; typhlosole absent. Nephridia : in the forebody, astomate, avesculate, exonephric meronephridia commencing in II, few in number, all (?) associated with setal lines *a*, *b*, *c* and *d* ; tufts absent. Caudally in the four setal lines, or in *a*–*c* and above *d*, the median-most nephridium with a preseptal funnel. Holandric (funnels iridescent in X and XI) ; gymnorchous ; seminal vesicles spheroidal, in IX and XII. Metagynous ; ovisacs absent (holotype), but small sacs (ovisacs ?) in XIV in paratype 2. Prostates flattened tubular, tortuous, in XVIII and XIX ; two vasa deferentia joining the junction of each gland with its sinuous muscular duct (holotype) or joining the ectal region of the gland (paratype 2). Penial setae moderately stout, gently curved, tapering to a narrow point ; the ectal region of the shaft, with the exception of the vicinity of the tip, ornamented by oblique laterally sometimes interrupted circlets of irregular coarse teeth which are directed anteriorly but may be considerably elevated at their apices from the setal surface ; the circlets approximately 7 μ m apart (holotype, paratype 8) ; length of functional seta 0.8–1.0 mm ; general width of shaft 22, 17 μ m (holotype, paratype 8). Spermathecae 2 pairs. Diverticulum single, digitiform uniloculate ; shorter relative to the ampulla in paratype 2 compared with the holotype.

MATERIAL EXAMINED.

Melaleuca Inlet, Port Davey, 145°55'E. 43°20'S. Map, 17/1, Mr A. J. Dartnall, Dec 1967 – holotype TM : K220, paratype 1 TM : K324. New Harbour, 146°10'E. 43°30'S. Map, 18/5, Mr C. D. King, 27 Jan 1938 – paratypes 2 and 3 BM(NH) : 1973.2.7–8 ; paratypes 4–6 AM : W5208–5210 ; paratypes 7–8 BJ : T26–27.

REMARKS. The genital field of *C. dartnalli* is diagnostic but the species shows close affinities with *C. simsoni*. It differs from the latter, among other respects, in lacking dorsal pores and in origin of the intestine one segment further forward, in XVII.

Cryptodrilus enteronephricus sp. n.

Fig. 2, 20, 31E–G ; Plates 13–19. Table 7

l = 124, 110 mm, w = 4.6, 4.0 mm, s = 162, 168.

Prostomium epilobous $\frac{2}{3}$ with narrow open dorsal tongue. Dorsal pores absent. Setae 8 per segment in regular longitudinal rows throughout. Nephropores not, or only sporadically, visible. Clitellum annular, $\frac{1}{2}$ XIII–XVIII (paratype 1) or XVII, with weak extension to $\frac{1}{2}$ XVIII (holotype). Male pores small transverse slits, not on porophores, in *ab* of XVIII, nearer *a* than *b* (holotype) or (paratype 1) nearer *b* than *a*, with two penisetal pores median to each pore, the three pores of a side on a small indefinite papilla. Paired accessory genital markings at the posterior borders

of IX and X in *ab*, intersegmental in 16/17 in *a* and 17/18 and 18/19 in *ab* (holotype, paratype 1), and intersegmental in 19/20 in and median to *ab* (holotype); median markings occupying *aa* in 14/15 and 15/16 (holotype, paratype 1). Female pores anteromedian to setae *a* of XIV, at approximately $\frac{1}{3}aa$. Spermathecal pores 2 pairs, in 7/8 and 8/9, on small distinctly protuberant papillae in *ab*, shortly lateral of *a*.

TABLE 7

Intersetal distances in segment XII in *Cryptodrilus enteronephricus*

| | mm | | | | | | | |
|---------------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 1.0 | 0.5 | 1.3 | 1.3 | 2.0 | 1.3 | 1.3 | 0.5 |
| paratype 1 | 1.3 | 0.6 | 1.5 | 1.8 | 2.7 | 1.7 | 1.5 | 0.6 |
| paratype 3 | 1.2 | 0.5 | 1.3 | 1.3 | 1.8 | 1.3 | 1.3 | 0.5 |
| paratype 4 | 1.2 | 0.6 | 1.9 | 1.6 | 2.6 | 1.6 | 2.0 | 0.6 |
| paratype 6 | 1.3 | 0.6 | 1.7 | 1.8 | 2.5 | 1.8 | 1.7 | 0.6 |
| paratype 14 | 1.0 | 0.6 | 1.3 | 1.6 | 2.0 | 1.5 | 1.4 | 0.6 |
| paratype 15 | 1.7 | 0.8 | 1.5 | 1.9 | 2.6 | 1.9 | 1.5 | 1.0 |
| | standardized ($u = 100$) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 10.89 | 5.06 | 14.40 | 14.01 | 21.79 | 14.01 | 14.79 | 5.06 |
| paratype 1 | 11.03 | 5.07 | 13.11 | 15.50 | 22.65 | 14.30 | 13.11 | 5.07 |
| paratype 3 | 12.55 | 4.94 | 14.45 | 14.45 | 19.77 | 14.45 | 14.45 | 4.94 |
| paratype 4 | 10.09 | 4.90 | 15.56 | 13.26 | 21.61 | 13.26 | 16.43 | 4.90 |
| paratype 6 | 10.88 | 5.00 | 13.82 | 15.29 | 20.88 | 15.29 | 13.82 | 5.00 |
| paratype 14 | 10.15 | 5.60 | 12.60 | 15.75 | 19.95 | 15.40 | 13.65 | 5.60 |
| paratype 15 | 12.69 | 6.48 | 11.61 | 14.85 | 19.98 | 14.58 | 11.34 | 7.29 |
| mean | 11.18 | 5.29 | 13.65 | 14.73 | 20.95 | 14.47 | 13.94 | 5.41 |
| interval/ <i>ab</i> | 2.11 | 1.00 | 2.58 | 2.78 | 3.96 | 2.74 | 2.64 | 1.02 |

Last hearts in XIII (latero-oesophageal with supraoesophageal but no dorsal connectives in X–XIII). Commissurals in IX anteriorly, slender and dorsoventral, lacking supra-oesophageal connectives. Supra-oesophageal vessel in VIII–XIV, well developed.

Gizzard large and firm, with anterior rim, in V. Calciferous glands absent. Oesophagus vascularized in VIII–XIV. Intestinal origin XVI; a deep laminar dorsal typhlosole present, rapidly increasing in depth from XVIII, continued as a very low ridge or thickening into XVI; muscular thickening and caeca absent. Nephridia: large tufts in II–V send sheaves of forwardly directed ducts to the buccal cavity and pharynx, those in II discharging at the junction of buccal cavity and body wall, those in III entering the buccal cavity and those in IV and V joining the pharynx behind the brain. Succeeding segments with several astomate, avesiculate, exonephric parietal micromeronephridia on each side. Caudally with 4 exonephric, astomate, micromeronephridia on each side discharging in *a*, *b*, *c* and *d* lines and in addition a very large stomate megameronephridium which has a large preseptal funnel near the ventral nerve cord and loops far laterally (to approximately *c* line) before turning medianly to send a duct to the ventrolateral surface of the

intestine, i.e. enteronephric. All 5 nephridia on each side persisting to the caudal extremity. No ureter present.

Holandric (funnels iridescent in X and XI); gymnochorous; seminal vesicles racemose, in IX, X and XII. Metagynous; small ovisacs in XIV. Prostates linear, depressed, winding in XVIII–XXI; much lobulated but with a narrow axial lumen (tubuloracemose) but that on the right side in the holotype a broad flattened lobe in XVIII–XX and not resolvable into a linear form; vasa deferentia joining gland near its junction with the sinuous muscular duct. Penial setae moderately stout, gently curved, tapering ectally to a simple, moderately sharp (paratype 1) or (artefact?) truncated tip (paratype 14); the ectal region of the shaft, with the exception of the vicinity of the tip ornamented by about 20 irregular serrated circlets approximately $6\ \mu\text{m}$ apart; the serrations forming jagged lines with, here and there, individual narrow pointed teeth recognizable. The circlets complete or interrupted along the lateral aspect of the seta, if interrupted the two halves tending to alternate along the seta. Length 1.05, 0.81 mm; general width of shaft = $28\ \mu$, 22 (paratypes 1, 14). Spermathecae 2 pairs, with ovoid ampulla and approximately equally long duct which is joined at midlength by an ovoid unstalked diverticulum.

Genital markings. The following conclusions are drawn from examination of the holotype and eight fully clitellate paratypes: paired genital markings are always present posteriorly in X but may be absent (paratypes 4, 5) in IX; the greatest extent of genital markings occurs in P10 in which, in addition to the markings in IX and X, there are median markings in 13/14 and 14/15 and paired markings in each of intersegmental furrows 15/16–20/21; markings are present in all specimens in each of intersegments 15/16–18/19. Those in 15/16 are usually median as are those in 14/15 if present; those in 13/14 (seen in only two specimens) are median or paired; all other markings are paired though there may be some tendency to unite medianly. Paired markings in IX and X are virtually in line with the spermathecal pores, in *ab* usually nearer *a*.

Distribution of accessory genital markings
in *Cryptodrilus enteronephricus*

| | H | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P10 | Total |
|-------|----|----|----|----|----|----|----|----|-----|-------|
| IX | p | p | p | p | | | p | p | p | 7 |
| X | p | p | p | p | p | p | p | p | p | 9 |
| 13/14 | | | | | p | | | | m | 2 |
| 14/15 | | | | | p | | m | m | m | 6 |
| 15/16 | m | m | m | p | pm | pm | m | m | p | 9 |
| 16/17 | pm | p | p | p | pm | p | p | pm | p | 9 |
| 17/18 | p | p | p | p | p | p | p | p | p | 9 |
| 18/19 | p | p | p | p | p | p | p | p | p | 9 |
| 19/20 | p | | p | p | p | p | | | p | 6 |
| 20/21 | | | p | p | p | p | | | p | 5 |

m=median; p=paired; pm=paired tending to fuse medianly. H=holotype; P=paratype.

Other variations. Seven specimens, including the holotype, were examined internally. Constant features included: location of gizzard in V; intestinal origin

in XVI; large typhlosole; enteronephric megameronephridia caudally and absence of bladders; seminal vesicles in IX, X and XII; presence of penial setae and 2 pairs of spermathecae. A major variation was location of last hearts in XII in paratypes 3, 4 and 5, in contrast with location in XIII in the holotype and paratypes 1, 6 and 10. Such variation is highly exceptional intraspecifically but there appear to be no grounds for regarding the individuals with hearts in XII as specifically distinct. Ovisacs were seen only in paratypes 1 and 5.

MATERIAL EXAMINED.

Dee Bridge, Lyell Highway, 146°35'E. 42°15'S. Map, 13/7, Dr J. L. Hickman, 24 May 1954 - holotype TM: K325. Tarraleah, Lyell Highway, 146°25'E. 42°20'S. Map, 13/4, Dr J. L. Hickman, 22 May 1954 - paratypes 4 and 5 AM: W5211-5212; paratypes 18 and 19 BJ: T34-35. Tarraleah, over pipeline, Dr J. L. Hickman, 27 May 1954 - paratypes 11-15 BJ: T28-32. Marlborough Highway (near Bronte), 146°30'E. 42°10'S. Map, 13/6, Dr J. L. Hickman, 26 May 1954 - paratype 1 BM(NH): 1973.2.9; paratype 2 BJ: T33; paratypes 6-10 TM: K326-330. Lyell Highway, 5 miles from Bronte towards Hobart, 146°35'E. 42°15'S. Map, 13/7, Dr J. L. Hickman, 24 May 1954 - paratype 3 BM(NH): 1973.2.10.

REMARKS. *C. enteronephricus* appears to be related to *C. polynephricus*, and especially to the subspecies *urethrae*, but differs notably from that species (*q.v.*) in having enteronephric intestinal nephridia. The development of enteronephry represents a major departure from perionychin organization and the attainment of a condition previously known only in the distinct tribe Megascolecini which, in *sens. strict.*, is otherwise represented in Tasmania only by *Oreoscolex*.

Cryptodrilus ? *officieri* Spencer, 1895

Fig. 2

Cryptodrilus officieri Spencer, 1895: 44-45, Pl. III, fig. 28-30.

Trinephrus officieri; Michaelsen, 1900: 186-187.

Notoscolex officieri; Jamieson, 1971c: 79.

Cryptodrilus officieri; Jamieson, 1972b: 166.

l = 44 mm, w = 6 mm, s ?

Prostomium epilobous $\frac{3}{4}$. First dorsal pore 4/5. Setae 8 per segment, irregular caudally. Clitellum annular, XIV-XVII. Male pores on papillae on XVIII, in *b*. Accessory genital markings paired elliptical patches in 15/16 and 16/17 in *b*, and in 19/20 in *ab*. Female pores presetal and close together in XIV. Spermathecal pores 3 pairs, in 6/7-8/9, shortly above *b*.

Last hearts in XII, no continuous supra-oesophageal. Gizzard well marked, segment ? (no distinct septa in front of 7/8); true calciferous glands absent but vascular swellings in XIII-XV; intestinal origin XVII. Nephridia; 3 tufts on each side. Holandric; seminal vesicles racemose in IX and XII. Metagynous. Spermathecae 3 pairs, in VII, VIII and IX; diverticulum a group of finger-like processes, the ampulla long and irregular in outline.

TYPE-LOCALITY. King River Valley. Map, 12/1.

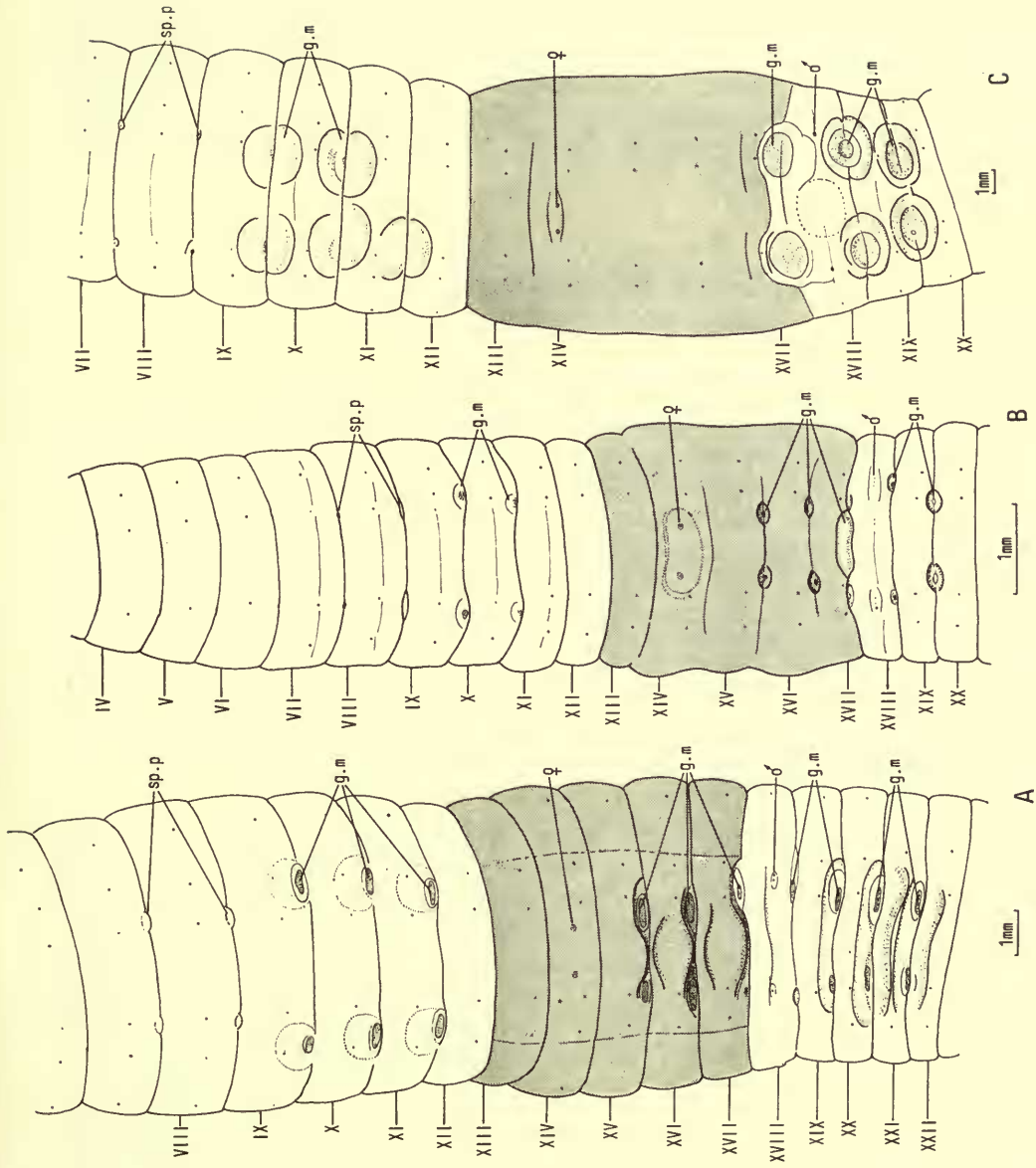


FIG. 21. Genital fields. A, *Cryptodrilus polynephricus polynephricus*, specimen 1. B, *C. p. ad urethrae*, specimen 44. C, *C. p. urethrae*, holotype.

MATERIAL EXAMINED.

None available.

REMARKS. Spencer's statement that the nephridia are like those of *C. fastigatus* and *C. dubius* necessitates placing *officieri* in *Cryptodrilus* but inclusion in this genus is questionable. The multiloculate spermathecal diverticulum raises the possibility that it is an *Oreoscolex*, the 3 pairs of spermathecae and the configuration of the genital field being reminiscent of *O. sexthecatus*. The latter species is distinguished, so far as the inadequate description of *C. officieri* indicates, by the more ventral position of the spermathecal pores (in *b* lines). New material of *C. officieri* is required if its status is to be settled.

Cryptodrilus polynephricus Spencer, 1895

Cryptodrilus polynephricus Spencer, 1895 : 35-36 Pl. 1, fig. 4, 5, 6.

l = 98-330 mm, w (midclitellar) = 4.5-12 mm, s = 127-175.

Prostomium epilobous $\frac{1}{2}$, $\frac{2}{3}$ to tanylobous, sometimes canaliculate. Dorsal pores absent. Setae 8 per segment, in regular longitudinal rows throughout; *a* and *b* absent on XVIII. Nephropores minute, only sporadically if at all visible. Clitellum annular, XIII-XVII. Male pores on XVIII in *ab*, not usually on papillae; 2 separate penisetal follicles usually visible median to each male pore. Accessory genital markings; an anterior series of 3 pairs of elliptical markings posteriorly in IX, X and XI, or at the posterior intersegment of each of these, in *ab*, or median of *a*, or some or all of these markings absent, or additional markings present at the posterior margins of VII, VIII and XII. A posterior series of paired or median transverse markings present in or immediately anterior to some of intersegments 12/13-21/22, more commonly in 17/18-19/20. Female pores in XIV, paired anteromedian of *a*, or unpaired midventral and presetal. Spermathecal pores 2 pairs, in 7/8 and 8/9, in or slightly lateral of *a*.

Last hearts in XIII (exceptionally, in some specimens of *urethrae*, in XII) those in X-XIII latero-oesophageal, with connectives from the supra-oesophageal vessel only. Gizzard large, strongly muscular, with anterior rim, in V. Extramural calciferous glands absent. Intestinal origin XVI; typhlosole absent, rudimentary or deep laminar; muscular thickening and caeca absent. Nephridia: several pairs of meronephric tufts discharging into the foregut; exonephric micromeronephridia present in most segments on each side in the four setal rows, usually with additional intervening nephridia, caudally with the medianmost nephridium enlarged as a megameronephridium, with preseptal funnel, the duct of which contributes to a longitudinal excretory duct (ureter) which apparently discharges into the ureter; nephridial bladders present or absent, if present number in a segment ranging from 4 to 10 per side. Testes and iridescent sperm funnels in X and XI; gymnorchous; seminal vesicles in IX and XII, or XI and XII or rarely IX, XI and XII. Prostates tubuloracemose, extending through 2 or more segments. Penial setae long and stout, when functional 0.7-4 mm long, with the general width of the shaft 23-45 μ m.

Metagynous; ovisacs present or absent. Spermathecae 2 pairs, in VIII and IX, diverticulum single, digitiform, uniloculate with or without a basal swelling.

TYPE-LOCALITY. Mt Wellington. Map, 14/4. Parattah. Map, 14/1.

DISTRIBUTION. See subspecies.

REMARKS. Two subspecies are here recognized and described below. Where a subspecific character does not vary from the specific description it is not repeated in the subspecific account.

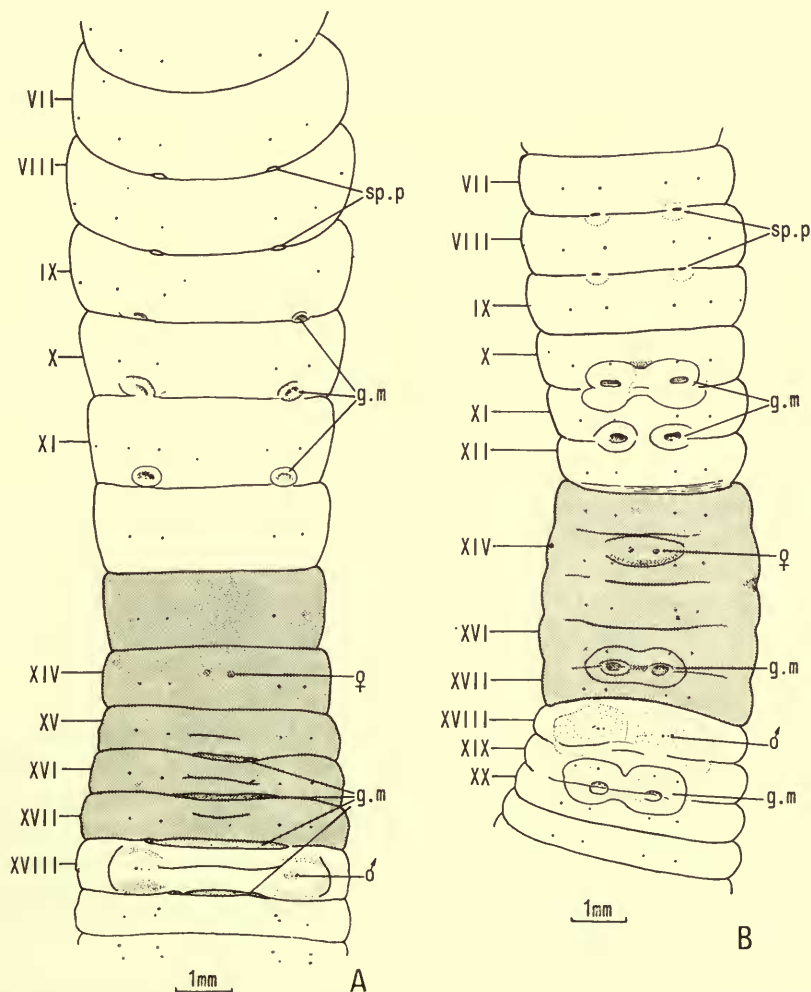


FIG. 22. Genital fields. *Cryptodrilus polynephricus polynephricus*: A, specimen 7; B, specimen 24.

Cryptodrilus polynephricus polynephricus Spencer, 1895

Fig. 2, 2IA, 22, 24A, 3IH; Plates 20-3I. Table 8

Cryptodrilus polynephricus Spencer, 1895: 35-36, Pl. 1, fig. 4, 5, 6.*Trinephrus polynephricus*; Michaelsen, 1900: 185-186.*Cryptodrilus polynephricus*; Jamieson, 1972b: 169-172, Fig. 6D, 7E, F, G.

1 = 98-200 mm (44 specimens), the extreme specimens with midclitellar widths of 4.5 and 8 mm, and segmental counts of 127 and 158, respectively.

Male pores not usually on papillae, sometimes on oval papillae which extend beyond *a* and *b* and occupy the posterior three-fourths of the segment. Accessory genital markings: characteristically with 3 pairs of anterior genital markings (raised or depressed glandular ellipses) posteriorly in IX, X and XI, in *ab*, in IX in or shortly median to *b*; in X slightly median to *b* or at approximately mid *bc*; in XI at mid *ab* or nearer but not in *a*, i.e. *lateral* of the line of the spermathecal pores and convergent posteriorly.

TABLE 8

Intersetal distances in segment XII in 14 specimens* of
Cryptodrilus polynephricus polynephricus

| | mm | | | | | | | |
|---------------------|--------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| maximum | 2.3 | 0.9 | 2.0 | 4.1 | 4.4 | 4.0 | 1.9 | 0.9 |
| minimum | 1.1 | 0.6 | 1.3 | 1.5 | 2.1 | 1.4 | 1.1 | 0.3 |
| mean | 1.8 | 0.7 | 1.6 | 2.8 | 3.2 | 2.7 | 1.6 | 0.7 |
| standard deviation | 0.3 | 0.1 | 0.2 | 0.9 | 0.7 | 0.8 | 0.2 | 0.1 |
| | standardized (<i>u</i> = 100) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| maximum | 13.45 | 6.90 | 14.94 | 20.86 | 24.41 | 20.50 | 13.64 | 0.36 |
| minimum | 10.63 | 3.54 | 9.24 | 13.03 | 18.16 | 13.22 | 8.43 | 3.54 |
| mean | 12.19 | 5.10 | 11.15 | 17.89 | 20.79 | 17.27 | 10.69 | 4.93 |
| standard deviation | 1.20 | 0.99 | 1.63 | 2.43 | 1.69 | 2.35 | 1.73 | 0.88 |
| interval/ <i>ab</i> | 2.39 | 1.00 | 2.19 | 3.51 | 4.08 | 3.39 | 2.10 | 0.97 |

* Specimens 1, 4, 5, 7, 10, 12, 14, 18, 24, 26, 32, 34, 37 and 38.

Some individuals (14/4, 27 Oct 1955; 13 Nov 1954) lacking markings in IX and with those in X and XI in or median of *a*. Posterior genital markings in or immediately anterior to intersegmental furrows: median at 14/15, occasionally; paired or median at 15/16, commonly; paired or median at 16/17, 17/18 and 18/19, almost invariably; paired but usually medianly conjoined in 19/20, usually, in 20/21, commonly, and in 21/22 rarely; the paired markings centred from *ab* to median of *a*. Female pores are an inconspicuous pair in XIV, anteromedian of *a*. Spermathecal pores on small papillae.

Internal anatomy (paralectotype 1; gross anatomy confirmed from all localities and details from 14/4, specimen 12): supra-oesophageal vessel in $\frac{1}{2}$ VIII- $\frac{1}{2}$ XIII, moderately developed. Oesophagus somewhat dilated in VIII; in IX-XIII

moderately and uniformly dilated and slightly moniliform; in XIV and XV more slender. Intestinal typhlosole absent though in specimen 12 a low diffuse dorsal ridge is perceptible from XXIV posteriorly.

Nephridia: vesiculate stomate and astomate nephridia and several pairs of meronephric buccal tufts. The ovoid-sub-spherical bladders each receive a single duct from a simple or completely coiled nephridium. The arrangement of the bladders is as follows: at the posterior end of the body there are 5 (presetal) bladders on each side, one in each of the four setal rows and a supernumerary bladder in *cd*, giving 10 bladders per segment; the nephridia supplying these posterior bladders are small and compact but there is in addition an enlarged nephridium (megameronephridium), with a preseptal funnel, the duct of which contributes to a longitudinal excretory duct (ureter), passes through many caudal segments and appears to discharge at junction of rectum and body wall. In the forebody a bladder persists in each of the four setal lines of a side but, in addition 1-3 supernumerary bladders are present in *cd* and 1 or 2, usually 2, between *d* line and the middorsal line; very occasionally there is a single supernumerary bladder in *bc*. The number of bladders on *each* side in the forebody thus varies from 4 to 10. No bladders are detectable in segments I and II (paralectotype 1) but one is present in *d* in specimen 12, and the *a* bladder appears to be absent in III and is not observable in paralectotype 1, though present in specimen 12 in the anterior spermathecal segment, VIII. Where two bladders are present above *d*, one is anterior in the segment and the other is equatorial and less lateral. Sporadically in paralectotype, but not in specimen 12, there are two bladders in *c*, one anterior and one shortly presetal. Numbers of bladders counted on one side in paralectotype 1 are: I, 0; II, 0; III, 4; IV, 6; V, 9; VI, 9; VII, 8; VIII, 7; IX, 9; X, 10; XI, 10; XII, 10; XIII, 9; post-prostatic, 8; caudal, 5; these numbers agreeing well though not always exactly with those in specimen 12. Large paired tufted nephridia, each consisting of numerous spiral loops, lie in segments II-IX; each tuft in III-IX contributes to a composite duct which is continuous, on each side of the nerve cord, from segment IX to the lower lip of the mouth (paralectotype 1) or the buccal cavity (specimen 12). Each of the pair of tufts in II sends a separate composite duct to the lower lip, lateral of the other longitudinal duct and sends a few very slender ducts laterally to the body wall presetally in *c* although no bladder is detectable.

Simple large saccular seminal vesicles in IX and XII. Prostates irregular, lobulated to racemose, linear structures, extending through XVIII-XXI (XVIII-XIX in paralectotype 3); each with a sinuous narrow muscular duct which is joined entally near its junction with the gland, by the vas deferens. In transverse section (paralectotype 1) each gland is seen to have a narrow central lumen around which are many distinct groups of glandular cells, each group with the appearance of a liver lobule. The cells of the lobule radiate from a central axis which in some cases can be seen to form a definite lumen although this is not lined by a recognizable epithelium. The epithelium of the central lumen of the gland is sporadically interrupted to receive the lumina or axial cores of the lobuli. Width of the gland: width of the central lumen = 1.61 : 0.18 mm = 9 : 1. Penial setae stout, curved, tapering ectally to a simple blunt tip; the ectal tapered region strongly convex 'dorsally', less convex, to

concave, 'ventrally'. The ectal region typically (paralectotype 3) ornamented with approximately 16 circlets spaced at regular intervals averaging $10\ \mu\text{m}$, each circlet serrated by very numerous simple minute contiguous spines; the spines anteriorly directed, adpressed to the surface of the seta, only slightly notching the seta in profile. Specimens from other localities are similar in general form and may have similar ornamentation, or the circlets may be interrupted in such a way that the different portions are not always in the same transverse line, and in some specimens (e.g. 7/2, specimen 1) there is no regular transverse arrangement of spines but merely scattered short transverse groups. Sometimes (13/4, specimen 5) there are short spine-like ridges adherent longitudinally to the setal surface immediately ectal to the spines (and also a tendency to longitudinal furrowing of the seta); the presence of ridges in this specimen approaches the condition characteristic of *C. polynephricus polynephricus* ad *urethrae* (q.v.); lengths of well developed setae $0.73\text{--}1.5\ \text{mm}$, general width of shaft $23\text{--}37\ \mu\text{m}$ (paralectotype 3; specimens 1, 5, 10, 14, 18, 24, 34, 42). Metagynous; ovisacs not developed (paralectotype 1) or present (specimen 12 and other, but not all, specimens). Spermathecal diverticulum (inseminated) digitiform.

TYPE-LOCALITY. Mt Wellington; Hobart. Map, 14/4. Parattah. Map, 14/1.

MATERIAL EXAMINED.

Mt Wellington, $147^{\circ}15'E. 42^{\circ}55'S$. Map, 14/4, NMV:G1436, 3 paralectotypes.* Fern Glade, Emu R., Burnie, under logs, $145^{\circ}55'E. 41^{\circ}05'S$. Map, 7/2, Dr J. L. Hickman, 17 May 1954 - specimens 1-4 BM(NH):1973.2.11-14. Tarraleah, over pipeline, $146^{\circ}25'E. 42^{\circ}20'S$. Map 13/4, Dr J. L. Hickman, 27 May 1954 - specimens 5-6 BM(NH):1973.2.15-16. Collinsvale, near Hobart, myrtle forest, $147^{\circ}15'E. 42^{\circ}50'S$. Map, 14/3, Dr J. L. Hickman, 8-9 Nov 1955 - specimens 7-11 BJ:T38-42. Mt Wellington, $147^{\circ}15'E. 42^{\circ}55'S$. Map, 14/4, Dr J. L. Hickman, 27 Oct 1955 - specimens 12 and 13 BJ:T39-40; under stones on top of mountain, Dr J. L. Hickman, 13 Nov 1954 - specimen 14 BJ:T41; specimen 15 AM:W5213; specimens 16 and 17 BM(NH):1973.2.17-18. Shoobridge Bend track, altitude approximately 580 m, in loam and clay in eucalypt - fern woodland, Dr B. G. M. Jamieson and Mr E. A. Bradbury, 19 Aug 1971 - specimens 18-23 BJ:T42-47. Hobart, Waterworks Road, under stones, $147^{\circ}20'E. 42^{\circ}50'S$. Map, 14/5, Dr J. L. Hickman, 17 Aug 1954 - specimen 24 BM(NH):1973.2.19; specimen 25 BJ:T48. Lenah Valley, near Newton Falls, under stones, Dr J. L. Hickman, 24 Jun 1957 - specimen 26 AM:W5214; specimens 27-33 AM:5305-5311; Lenah Valley, New Town Creek, Dr J. L. Hickman, 15 Sep 1953 - specimens 34-36 TM:K331-333; 31 Aug 1953 - specimen 37 TM:K334. 'Tasmania', Dr J. L. Hickman, specimens 38-41 TM:K335-338.

REMARKS. In the above account the occurrence of a pair of longitudinal excretory ducts and associated stomate megameronephridia is demonstrated for the first time.

C. polynephricus polynephricus is distinguishable from *C. p. urethrae* and from the closely related *C. enteronephricus* in location of the anterior genital markings, or at least those in IX, significantly lateral of the spermathecal pores. The similarity, nevertheless, of the genital fields and general anatomy of *C. polynephricus* and *C. enteronephricus*, and the intermediate position of *C. p. urethrae* (q.v.) indicate speciation from a common origin within the genus.

* The specimen designated the lectotype by Jensz and Smith (1969), G41, is here shown to be a specimen of *Perionychella (Vesiculodrilus) morioni*. This specimen is clearly not a syntype as it did not contribute to the type-description of *C. polynephricus*. Smith has agreed that its designation as the lectotype was invalid according to Article 74(a)(i) of the International Code of Zoological Nomenclature.

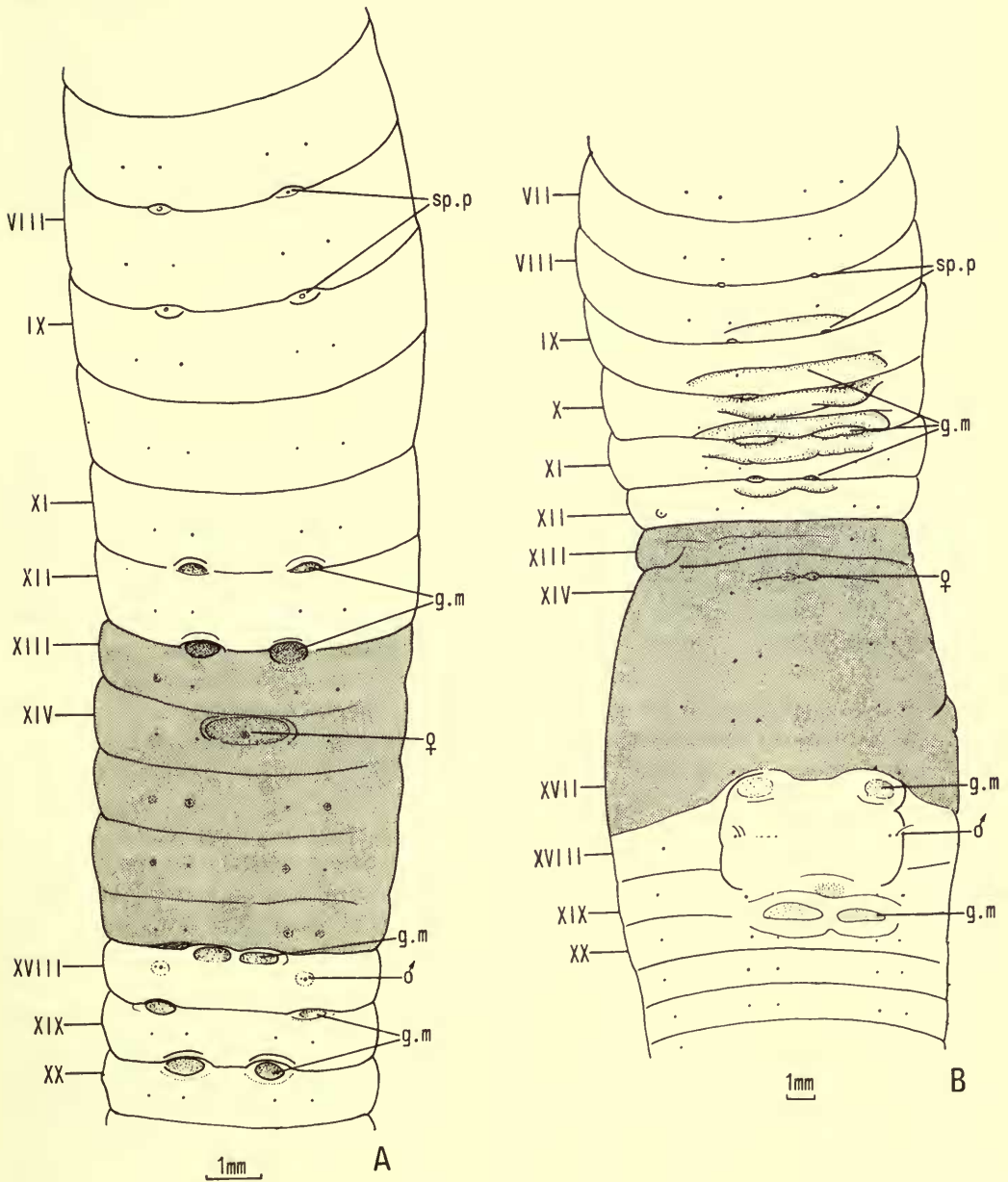


FIG. 23. Genital fields. *Cryptodrilus polynephricus urethrae*: A, paratype 8; B, paratype 20.

Specimens 14-17, from the summit of Mt Wellington, and specimens 24 and 25, from Hobart, display a distinct genital field, lacking genital markings in IX, and having those in X and XI further median than is usual. They are also characterized by a longitudinal reduplication of the nephridial bladders in *c* lines but the latter condition occurs sporadically, in some segments, in the paralectotypes of which, though they are incompletely mature, one has rudiments of a normal field, with genital markings in IX and X well lateral of the spermathecal pores. As the nephridial condition of the atypical specimens is echoed in the types, and in view of the great variation in the genital fields reported for another species of *Cryptodrilus* (*C. fastigatus* v. Jamieson, 1972b) erection of a separate taxon for specimens 14-17, 24 and 25 does not seem warranted.

Cryptodrilus polynephricus urethrae subsp. n.

Fig. 2, 21C, 23, 24C, 31J-M; Plates 44-59. Table 9

l = 330, 160 mm; w = 12, 6 mm; s = 175, 156.

Prostomium epilobous $\frac{1}{2}$, $\frac{2}{3}$; dorsal tongue moderately narrow, closed and (in holotype) weakly canaliculate. Paired elliptical accessory genital markings with centres in *a* and with wide, whitish glandular borders, in intersegments 9/10 and 10/11 (holotype, paratype 1) and 11/12 (paratype 1) or unilateral, on the right, in holotype. Similar markings centred in *a* in 17/18; in *ab*, nearer *a*, in 18/19 and median to *a* in 19/20. Female pore in XIV, paired anteromedian of *a* in holotype; unpaired, mid-ventral, in paratype 1. Spermathecal pores very slightly lateral of *a*.

TABLE 9

Intersetal distances in segment XII in 13 specimens* of
Cryptodrilus polynephricus urethrae

| | mm | | | | | | | |
|---------------------|--------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 4.0 | 1.1 | 2.4 | 2.3 | 14.0 | 2.6 | 3.0 | 1.1 |
| maximum | 4.0 | 1.1 | 2.9 | 3.3 | 14.0 | 3.1 | 3.0 | 1.1 |
| minimum | 1.6 | 0.6 | 1.6 | 1.9 | 2.7 | 1.9 | 1.6 | 0.6 |
| mean | 2.5 | 0.9 | 2.1 | 2.3 | 6.7 | 2.3 | 2.1 | 0.9 |
| standard deviation | 0.8 | 0.2 | 0.4 | 0.4 | 3.4 | 0.3 | 0.4 | 0.2 |
| | standardized (<i>u</i> = 100) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 13.02 | 3.72 | 7.91 | 7.44 | 45.58 | 8.37 | 9.77 | 4.19 |
| maximum | 16.14 | 5.83 | 14.29 | 15.92 | 45.58 | 15.92 | 14.29 | 5.83 |
| minimum | 9.30 | 3.45 | 7.91 | 7.44 | 20.11 | 8.37 | 9.09 | 3.45 |
| mean | 12.61 | 4.71 | 10.76 | 12.20 | 31.91 | 12.19 | 10.88 | 4.75 |
| standard deviation | 1.75 | 0.72 | 1.81 | 2.74 | 7.66 | 2.43 | 1.53 | 0.69 |
| interval/ <i>ab</i> | 2.68 | 1.00 | 2.28 | 2.59 | 6.77 | 2.59 | 2.31 | 1.01 |

* H, paratypes, 1, 7, 8, 9, 10, 12, 13, 16, 18, 20, 21 and 22.

Supra-oesophageal vessel recognizable in $\frac{1}{2}$ VIII, IX-XIII, XIV well developed. Oesophagus vascularized and dilated segmentally in VIII-XIII, XIV; intestinal

typhlosole absent or a rudimentary, very low ridge present from approximately XXIV (paratype 1 and holotype respectively). Nephridia: 5 pairs of large tufts, each with multiple ducts, in II-VI; the ducts of those of II discharging at the junction of mouth and body wall; those of III-VI sending composite ducts to a simple, though still composite, common longitudinal duct which passes forwards to the anterior end of the pharynx (i.e. enteronephric); sparse exonephric micromeronephridia present on the body wall lateral to each tuft. Nephridia in VII forming smaller tufts which discharge exonephrically in this segment (and holotype, in VI?) and appear to send some ducts to the common duct of the anterior tufts; a tendency to ventral tufting continues but decreases to the anterior intestinal region where there are approximately 10 (paratype 1) to 15 (holotype) exonephric micromeronephridia on each side; the nephridia discharging presetally in *a*, *b*, *bc*, *c*, *cd* and above *d*. The median nephridium of the first intestinal segment (XVI) is the first to have a preseptal funnel (lying in XV) (demonstrated in paratype 1). This arrangement of nephridia persists posteriorly but the stomate nephridium now enlarges to become a megameronephridium, the duct of which discharges in *a* line together with one or two astomate micromeronephridia. Caudally there is an astomate micromeronephridium in each of setal lines *a*, *b*, *c* and *d* and 4 above *d* on each side (holotype, there being few if any above *d*, but additional intersetal nephridia in paratype 1); the megameronephridium contributes its duct to a slender longitudinal excretory duct (ureter) of which there is one on each side of the ventral nerve cord; the posterior end of this ureter was traced into the extreme caudal segments but its termination was not elucidated. Nephridial bladders totally absent.

Racemose seminal vesicles in XI and XII (holotype, paratype 1) with a unilateral rudiment in IX in holotype. Prostates depressed tubuloracemose, in XVIII-XIX (holotype)-XX (paratype 1), irregular in width and lobulated, with very narrow central lumen. Penial setae moderately stout, ectally strongly curved, the tip, which may or may not be reflexed dorsally or bent ventrally, strongly flattened and almost parallel sided, only slightly tapering ectally, and sometimes ventrally somewhat inrolled; the end almost straight or convex and simple or denticulate; ornamentation ental to the depressed apical region (holotype) consisting of numerous transverse rows, spaced at approximately 6 μm intervals, each row minutely serrate, the teeth of the serrations very numerous, closely contiguous, in a single series, minute but attenuated in the axis of the seta, short ridges like a fringe present ectal to each tooth row; the setal surface also with numerous longitudinal furrows. In other specimens the tooth rows may be broken up into short transverse or oblique series of several to many teeth and these groups may lie in the same transverse or oblique line as adjacent groups or may be scattered apparently randomly. length = 2.1-3.9 mm, general width of shaft = 39-45 μm (holotype; paratypes 1, 6, 20).

Spermathecal diverticulum simple, uniloculate but with a basal swelling.

VARIATION.

Genital markings. The genital field in this subspecies is distinguished from that of *C. p. polynephricus* by location of the post-spermathecal, preclitellar accessory genital markings in or median to the longitudinal lines of the spermathecal pores;

the latter pores are usually in or very slightly lateral of *a* lines. In paratypes 18 and 19 the genital markings are further lateral in *ab*, but are not significantly lateral of the spermathecal pores as these are similarly displaced. It can be seen in the following table that the genital fields in the holotype and paratype 1 are representative of the most common conditions in the remaining paratypes. Paratypes 2, 6 and 22 are shown to have atypical fields but at present there appears to be no justification for giving them separate taxonomic status.

Variation in the genital markings of 26 specimens of
Cryptodrilus polynephricus urethrae

| Genital markings | Specimen | Total number of specimens | |
|--|----------|---|----|
| Small elliptical paired in <i>ab</i> to median of <i>a</i> at hind margin of VII | P6, 22 | 2 | |
| | VIII | P2, 22 | 2 |
| | IX | P2 | 1 |
| | X | P2 | 1 |
| | | | |
| Paired intersegmental in line with or median to the spermathecal pores in | 9/10 | H P1, 3, 4, 5, 10, 11, 16, 17, 18, 19, 20, 21, 23, 25, 26 | 16 |
| | 10/11 | H P1-5, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20-26 | 21 |
| | 11/12 | H(R) P1-5, 8, 12-14, 18-21, 23-26 | 18 |
| | 12/13 | P4, 5, 8, 12 | 4 |
| | 16/17 | P9 | 1 |
| | 17/18 | H P1-5, 10-14, 16-19, 21-26 | 21 |
| | 18/19 | H P1-6, 8, 10-12, 14, 16-19, 21-26 | 22 |
| | 19/20 | H P1-6, 8, 10-13, 16-19, 21 | 17 |
| | 20/21 | P8 | 1 |
| | 21/22 | P8 | 1 |

H = holotype; P = paratype.

Other variation. Anatomical variation in this subspecies in some systems exceeds what would normally be expected within a species. Thus though a typhlosole is absent or rudimentary in the holotype and paratype, respectively, there is a definite laminar typhlosole in paratypes 2, 10, 11 and 20 and appreciable typhlosoles are present in a considerable proportion of the remaining type-specimens. In specimens from the same sample (e.g. 13/3, paratypes 10-12) there may be variation from a deep, to a moderate, to a very rudimentary typhlosole. Other morphological variation does not appear to correlate with this typhlosole variation and all specimens are distinguished from the typhlosole *C. enteronephricus* in lacking segmentally enteronephric nephridia and in having a ureter. Variation in the distribution of seminal vesicles also occurs from IX and XII, to IX, XI and XII, to XI and XII and, most remarkably, the female pore is paired or (paratypes 1, 3, 4, 8, 12, 26) unpaired, median.

Variation in setal ratios is considerable (Table 9) and one of the more extreme variants (paratype 9) has the last hearts in XII.

REMARKS. The location of the preclitellar genital markings approximately in line with or median to the spermathecal pores, the absence of nephridial bladders and the widened ends of the penial setae distinguish this subspecies from the nominate subspecies.

MATERIAL EXAMINED.

Arne Road, E. side of Styx River bridge, approx. 1000 ft into rainforest, 146°35'E. 42°50'S. Map, 13/8, Mr D. Frankombe, 24 Sep 1958 - holotype TM: K341; paratype 2 TM: K342. Arne Valley, 10 miles from Greenveston, 146°50'E. 43°10'S. Map, 18/3, Dr J. L. Hickman, 11 Nov 1955 - paratype 1 BM(NH): 1973.2.24; paratypes 3-5 TM: K343-345; paratypes 22-25 TM: K346-349. Florentine Valley, surface soil under litter in *E. regnans* forest, under stones, 146°25'E. 42°35'S. Map, 13/3, Mr M. Gilbert, 7 Mar 1956 - paratype 6 BM(NH): 1973.2.25; Florentine, Mr J. M. Gilbert, 21 Jul 1955 - paratype 7 TM: K350; Florentine, rainforest soil, Mr J. M. Gilbert, 4 Aug 1955 - paratypes 8 and 9 AM: W5313-5314; Florentine Valley, under pieces of wood and bark, Mr J. M. Gilbert, 14-19? Aug 1955 - paratypes 10-12 AM: W5315-5317. Tarraleah, 146°25'E. 42°20'S. Map, 13/4, Professor V. V. Hickman, Dec 1953 - Jan 1954 - paratypes 13 and 14 BJ: T52-53. Dee Bridge, Lyell Highway, 146°35'E. 42°15'S. Map, 13/7, Dr J. L. Hickman, 24 May 1954 - paratype 15 BJ: T54. Maydena, 146°40'E. 42°45'S. Map, 13/9, Dr J. L. Hickman, 15 Oct 1960 - paratypes 16 and 17 BM(NH): 1973.2.26-27. Russel River, Mr C. D. King, 16 Feb 1939 - paratypes 18 and 19 BJ: T55-56. Kallista, near Juneee, 146°35'E. 42°45'S. Map, 13/11, Mrs Rodway, Tasmanian Biological Survey: De13, 19 Apr 1938 - paratype 20 BJ: T57. Snowy Mts, 4000 ft, 146°40'E. 43°00'S. Map, 18/2, Tasmanian Biological Survey: J8, Mr C. D. King, 19 Jan 1939 - paratype 21 TM: K351.

REMARKS. The separate subspecies, *C. polynephricus urethrae* (and possibly it should be a species) is recognized for specimens which have anterior genital markings in or median to the spermathecal lines and which lack bladders while possessing ureters. It appears to be linked to the nominate subspecies by intermediate forms which are described below.

Whether *polynephricus* and *urethrae* are to be retained as subspecies or should be regarded as sibling species cannot be unequivocally decided at present as knowledge of them is limited to their morphology and inadequate geographical evidence. The map (Fig. 2) shows that they are largely allopatric. Their morphological similarity, which exceeds that between most species, and the occurrence of morphological intermediates where their distributions overlap, are taken for the time being to indicate that they are subspecies.

Cryptodrilus polynephricus polynephricus ad *urethrae*

Fig. 2, 21B, 24B, 31I; Plates 32-43. Table 10

Some specimens (42-45, 47, 49), referable to *C. polynephricus polynephricus* from the appearance of the preclitellar genital field, differ from paralectotypes and other specimens described above in having the nephridial bladders limited to the hindbody where they are accompanied, as usual, by a ureter. These specimens are here included in the nominate subspecies but are distinguished as *Cryptodrilus polynephricus*

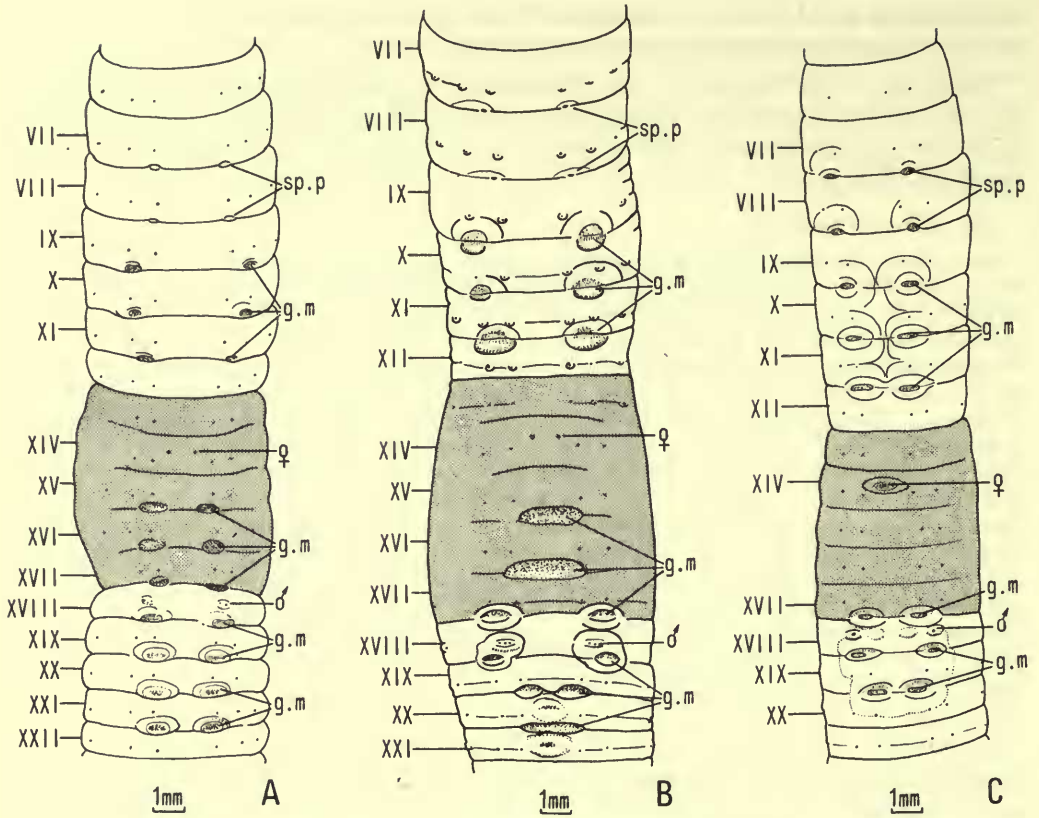


FIG. 24. Genital fields. A, *Cryptodrilus polynephricus polynephricus*, specimen 12. B, C. *p. p.* ad *urethrae*, specimen 49. C, *C. p. urethrae*, paratype 1.

polynephricus ad urethrae. With these are included two specimens (46 and 48) in which genital fields are undeveloped but which have the same nephridial condition. This '*polynephricus ad urethrae*' morph, in addition to general morphological resemblance to *C. p. polynephricus*, further resembles the latter in having seminal vesicles in IX and XII and simple-pointed penial setae although in specimen 44 this shows signs of the flattening characteristics of the penial setae of *C. p. urethrae*. (The latter specimen is exceptional in having last hearts in XII.) The ornamentation of some penial setae also seems to be intermediate between that in the two subspecies. As shown in the map (Fig. 2), the distribution of *polynephricus ad urethrae* is intermediate between, though partly overlapping, the distributions of the two subspecies, on present evidence. Details of the penial setae follow: setae stout, curved, tapering ectally to a simple blunt or flattened chisel-like tip; where simple tipped, the ectal tapered region strongly convex dorsally, less convex, to concave, ventrally. The ectal region ornamented with numerous transverse or oblique circllets, at intervals of approximately 10 μ m, each circllet serrated by very numerous spines which in some specimens (e.g. 13/3, specimen 42) are two deep and are immediately preceded

ectally by short spine-like ridges adherent longitudinally to the setal surface. Spines anteriorly directed, adpressed to the setal surface, only slightly notching the seta in profile. The circlets in some (e.g. 13/3, specimen 44) broken up and a regular transverse arrangement scarcely apparent. In 14/4, specimen 48, the setal surface bears numerous longitudinal furrows. In specimen 44 the spines are simple, and ridges and significant furrowing are lacking but the tip differs from the typical *polynephricus* condition in being flattened; $l = 0.55-1.75$ mm, general width of shaft = $19-30 \mu\text{m}$ (specimens 42, 44, 48, 49).

TABLE 10

Intersetal distances in segment XII in *Cryptodrilus polynephricus* ad *urethrae*

| | mm | | | | | | | |
|---------------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| specimen 42 | 1.3 | 0.6 | 1.1 | 1.6 | 2.6 | 1.8 | 1.1 | 0.6 |
| specimen 44 | 1.0 | 0.4 | 1.0 | 1.0 | 1.6 | 1.0 | 1.0 | 0.4 |
| specimen 45 | 1.0 | 0.4 | 0.9 | 1.0 | 1.3 | 1.0 | 1.0 | 0.4 |
| specimen 47 | 1.5 | 0.6 | 1.3 | 1.8 | 2.3 | 1.7 | 1.3 | 0.6 |
| specimen 48 | 1.3 | 0.7 | 1.1 | 1.5 | 2.5 | 1.5 | 1.1 | 0.7 |
| specimen 49 | 2.0 | 0.8 | 1.5 | 2.3 | 3.4 | 2.3 | 1.5 | 0.8 |
| | standardized ($u = 100$) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| specimen 42 | 12.00 | 5.33 | 10.67 | 15.33 | 24.00 | 16.67 | 10.67 | 5.33 |
| specimen 44 | 14.15 | 5.37 | 13.17 | 13.17 | 21.95 | 13.66 | 13.17 | 5.37 |
| specimen 45 | 14.21 | 5.58 | 13.20 | 14.72 | 18.78 | 14.72 | 13.20 | 5.58 |
| specimen 47 | 13.25 | 5.36 | 11.99 | 16.09 | 20.82 | 15.14 | 11.99 | 5.36 |
| specimen 48 | 12.46 | 6.40 | 10.44 | 14.81 | 24.24 | 14.81 | 10.44 | 6.40 |
| specimen 49 | 13.73 | 5.39 | 10.29 | 15.69 | 23.53 | 15.69 | 10.29 | 5.39 |
| mean | 13.30 | 5.57 | 11.63 | 14.97 | 22.22 | 15.12 | 11.63 | 5.57 |
| interval/ <i>ab</i> | 2.39 | 1.00 | 2.09 | 2.69 | 3.99 | 2.71 | 2.09 | 1.00 |

MATERIAL EXAMINED.

Florentine Valley, surface soil under litter in *E. regnans* forest, under stones, $146^{\circ}25'E$. $42^{\circ}35'S$. Map, 13/3, Mr M. Gilbert, 7 Mar 1956 - specimens 42 and 43 TM: K339-340; specimens 44 and 45 BJ: T49-50. Russell River, $146^{\circ}40'E$. $42^{\circ}45'S$. Map, 13/9, Mr C. D. King, 16 Feb 1939 - specimen 46 BM(NH): 1973.2.20. Mt Wellington, $147^{\circ}15'E$. $42^{\circ}55'S$. Map, 14/4, Dr J. L. Hickman, 13 Jan 1954 - specimen 47 AM: W5312; Betts Vale at creek, in moss, under logs and stones, Dr J. L. Hickman, 4 Mar 1954 - specimen 48 BJ: T51. Eagle Hawk Neck, in kelp on rocks, $147^{\circ}55'E$. $43^{\circ}00'S$. Map, 19/2, Dr J. L. Hickman, Apr 1956 - specimen 49 BJ: T51A.

Cryptodrilus simsoni Spencer, 1895

Fig. 2, 25A, 31N, O; Table 11

$l = 61$ mm, $w = 4$, 4.1 mm, $s = 95+$ (posterior amputee), 125 (lectotype, specimen 2).

Prostomium canaliculate, epilobous $\frac{3}{2}$, closed. First dorsal pore $3/4$. Setae 8 per segment in longitudinal rows, d irregular posteriorly. Nephropores not visible

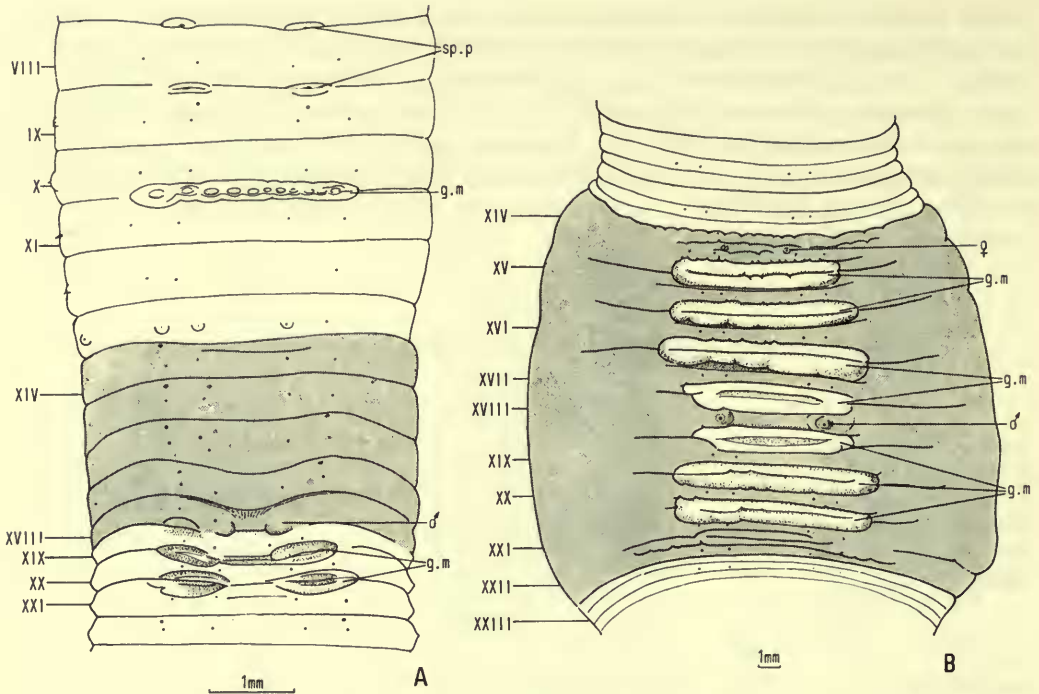


FIG. 25. Genital fields. A, *Cryptodrilus simsoni*, lectotype. B, *Pinguidrilus tasmanicus*, lectotype.

(specimen 2) or sporadically visible throughout (lectotype) and especially distinct on and shortly behind the clitellum where in each segment there are 6 presetal pores on each side; 1 median to *a*, 1 in each of *a*, *b*, *c* and *d* and 1 near the dorsal midline (lectotype). In some Fern Dene specimens there are as many as 3 presetal pores in the vicinity of each of setae *a* and *b* on the clitellum. Clitellum annular, XIII–XVIII, weak in XIII and XVIII but well developed between. Male pores on dome-shaped papillae with diameter equalling *ab* and central pore in *a*, on XVIII. Paired eye-like genital markings with centre in *b* at 19/20 and in *ab* at 20/21; a median transverse genital marking occupying *bb* in 11/12 (specimen 2) or 10/11 (lectotype) bearing a row of approximately 10 small circular markings corresponding with the intersegmental furrow. Female pores a pair of small slits just median and slightly anterior to *a* on XIV. Spermathecal pores 2 pairs, in 7/8 and 8/9, on small papillae in *a* (specimen 2) or slightly lateral of *a* (lectotype).

Last hearts in XIII (latero-oesophageal); connectives to dorsal and supra-oesophageal vessels present. Supra-oesophageal in IX–XIII (specimen 2); indistinct in lectotype. Gizzard small, easily compressible, in V. Extramural calciferous glands absent. Oesophagus with circumferential vascular striae and internally papilliform rugae in X–XVI (specimen 2), the rugae becoming definite lamellae in XIV–XV and less distinct in XVI in lectotype. Intestinal origin XVIII; typhlosole absent.

TABLE II

Intersetal distances in segment XII in *Cryptodrilus simsoni*

| | mm | | | | | | | |
|---------------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| lectotype | 1.4 | 0.4 | 1.3 | 1.4 | 4.8 | 1.3 | 1.3 | 0.4 |
| specimen 1 | 1.1 | 0.6 | 1.1 | 1.3 | 4.7 | 1.4 | 1.1 | 0.5 |
| specimen 2 | 1.0 | 0.5 | 1.2 | 1.1 | 4.3 | 1.1 | 1.2 | 0.5 |
| specimen 3 | 1.1 | 0.4 | 1.2 | 1.3 | 4.4 | 1.3 | 1.2 | 0.4 |
| specimen 4 | 1.1 | 0.5 | 1.0 | 1.3 | 4.3 | 1.3 | 1.1 | 0.5 |
| specimen 5 | 1.0 | 0.5 | 1.2 | 1.4 | 3.8 | 1.4 | 1.2 | 0.5 |
| | standardized ($u = 100$) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| lectotype | 11.48 | 3.36 | 10.08 | 11.20 | 38.64 | 10.64 | 10.08 | 3.08 |
| specimen 1 | 9.73 | 5.01 | 9.37 | 11.21 | 39.23 | 11.50 | 9.44 | 4.13 |
| specimen 2 | 9.15 | 4.25 | 11.11 | 10.13 | 39.54 | 10.46 | 11.11 | 4.25 |
| specimen 3 | 9.38 | 3.75 | 10.63 | 11.56 | 38.75 | 11.56 | 10.94 | 3.44 |
| specimen 4 | 9.87 | 4.14 | 9.24 | 11.78 | 39.17 | 11.78 | 9.87 | 4.14 |
| specimen 5 | 9.00 | 4.82 | 10.93 | 12.86 | 34.41 | 12.54 | 10.61 | 4.82 |
| mean | 9.77 | 4.22 | 10.23 | 11.46 | 38.29 | 11.41 | 10.34 | 3.98 |
| interval/ <i>ab</i> | 2.32 | 1.00 | 2.42 | 2.72 | 9.07 | 2.70 | 2.45 | 0.94 |

Nephridia: in the forebody and anterior intestinal region meronephridia discharge presetally in each of *a*, *b*, *c* and *d* lines and between *d* line and the middorsum. Those discharging in *c* and *d* lie far below these loci and have very long ducts. It was not possible to demonstrate unequivocally that there were two nephridia at *a* as the external pores indicate. In the most anterior segment the ventral nephridia form small (exonephric?) tufts and do not appear to be accompanied by the full complement of more dorsal nephridia; in the intestinal region there is a preseptal funnel on each side near the nerve cord, this condition persisting to the caudal extremity; median nephridia are not enlarged relative to others though they are moderately large. In the posterior region the dorsalmost nephridia discharge in an approximately straight line above, in or below *d* lines which are there irregular. In the midbody a small bladder-like dilatation (parasitic artefact?) of a nephridial duct is sporadically present though most ducts do not reveal even an intramural bladder.

Holandric (funnels iridescent in X and XI); gymnorchous; elongate racemose seminal vesicles in XI and XII, on the anterior septa; similar structures of unknown function are present on the anterior septum of X (specimen 2) and of preceding segments, to at least V (lectotype). Metagynous; ovisacs absent. Prostates restricted to XVIII, tongue shaped racemose but with a short narrower ectal portion prior to the duct and, in serial sections, revealing a single narrow central lumen with cuboidal epithelium. Vas deferens joining the ental end of the sinuous duct. Penial setae moderately slender, curved, needle like; the tip tapering narrowly, simply but bluntly pointed; ornamentation absent; length = 1.2-1.4 mm; general width = 13-14 μ m (specimen 2). Spermathecae 2 pairs. Diverticulum single, clavate, uniloculate (specimen 2) or circumscribed by a furrow so that it has a slight tendency to be bifid (lectotype).

Genital markings. The location of genital markings in 11/12 (in contrast with 10/11 in the lectotype), 19/20 and 20/21 is constant in the 9 Fern Dene specimens; the markings in 20/21 are always more median than those in 19/20.

TYPE-LOCALITY. Emu Bay. Map, 7/2. Launceston. Map, 9/5.

MATERIAL EXAMINED.

Launceston, 147°10'E. 41°25'S. Map, 9/5, A. Simson, Feb 1892, NMV: Gr82 - lectotype. Fern Dene, Ironcliff Road, near Penguin, 146°05'E. 41°05'S. Map, 8/1, Collector? 13 Oct 1954 - specimens 1-3 TM: K352-354; 4 BJ: T58; specimens 5 and 8 BM(NH): 1973.2.29-30; specimens 6 and 7 AM: W5318-5319; specimen 9 BJ: T59.

REMARKS. The transversely papillate or punctate ventral genital marking in 10/11 or 11/12 is distinctive of this species. The presence of dorsal pores also distinguishes it from all Tasmanian species.

Genus *PSEUDOCRYPTODRILUS* Jamieson, 1972b

DIAGNOSIS. A pair of combined male and prostatic pores on XVIII. Setae 8 per segment. *Nephridia* 2 to 3 on each side excepting caudally where there is a single pair of stomate holonephridia in each segment. Typhlosole weak or absent. Prostates depressed tubular.

DESCRIPTION. Terrestrial. Dorsal pores present. Setae commencing on II, in 8 longitudinal rows which may become irregular posteriorly. Ventral setal couples widely paired ($aa < 2ab$); setae of the dorsal couples widely separated, $cd > 2ab$ and approximately as far apart as the two setal couples of a side ($cd \div 0.8-1.1bc$); dorsal median intersetal distance approximately one-third of the circumference ($dd \div 0.3u$). Setae a' and b of XVIII replaced by penial setae. Nephropores inconspicuous. A pair of combined male and prostatic pores on XVIII; postclitellar. Spermathecal pores 2 pairs, in 7/8 and 8/9 or anteriorly in VIII and IX.

Dorsal blood vessel single, continuous onto the pharynx; last hearts in XII (latero-oesophageal). Subneural absent. Gizzard moderate to well developed, in V. Calciferous glands absent but oesophagus modified (dilated or internally rugose) in XV-XVI, XVII; intestinal origin XVIII or XIX; a low typhlosole present or absent. Anterior nephridia tuft-like or simple. Nephridia exonephric; in the anterior intestinal region 2 on each side; in the forebody 2 (*P. diaphanus*) or 3 (*P. acanthodriloides*, in which the median one is stomate); caudally holonephric, with a single stomate, avesiculate nephridium on each side. Holandric; gymnorchous; seminal vesicles in IX and XII. Prostates depressed tubular. Penial setae present. Metagynous; ovisacs present. Spermathecae with 1 or 2 clavate, uniloculate diverticula.

DISTRIBUTION. Eastern Subregion of Australia, southern faunal province: Victoria. Tasmania. (2 species.)

TYPE-SPECIES. *Megascolides diaphanus* Spencer, 1900.

TASMANIAN SPECIES. *P. acanthodriloides* sp. n.

REMARKS. The new species is included in the formerly monotypic *Pseudocryptodrilus* chiefly because it is a megascolecine which is meronephric anteriorly but

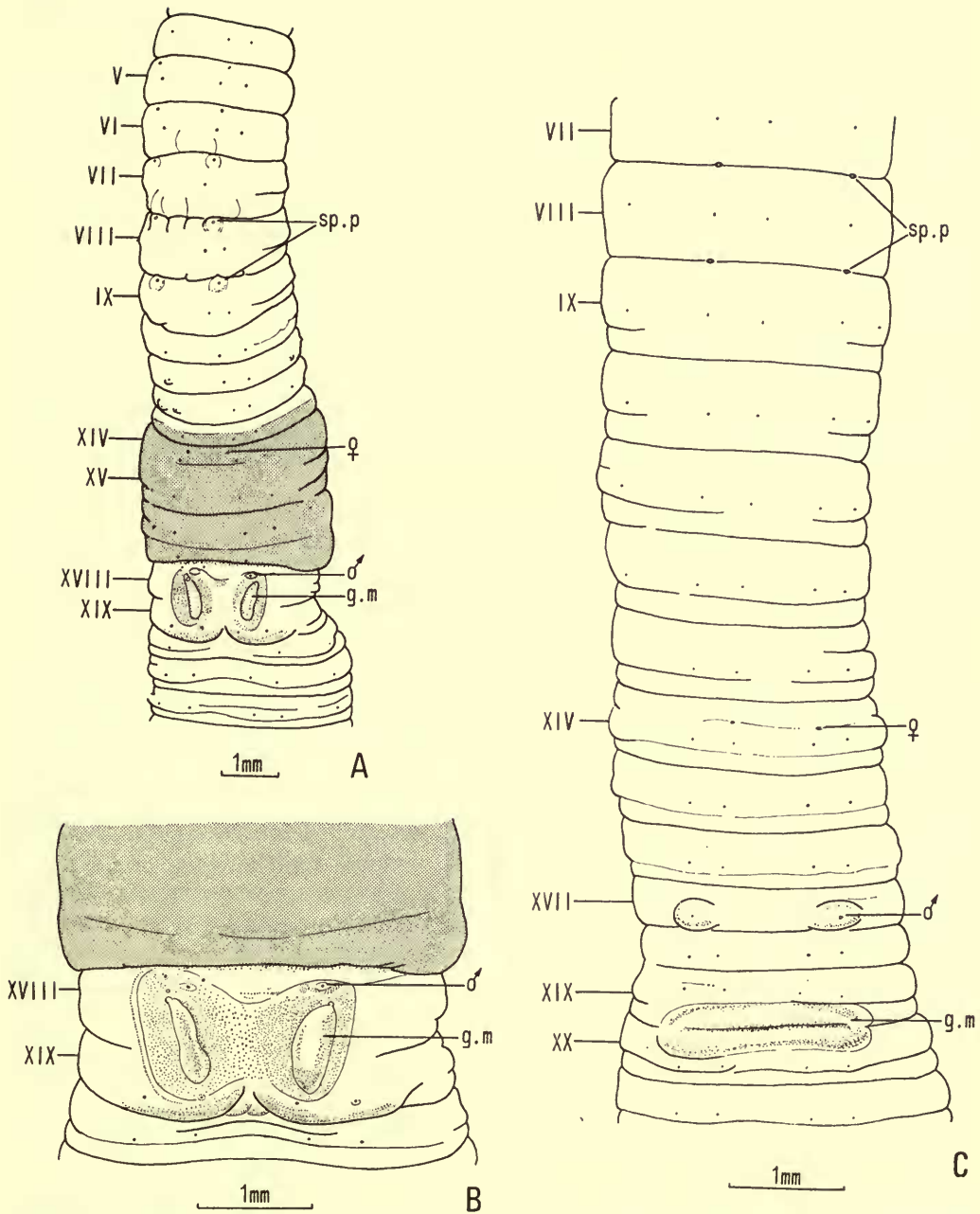


FIG. 26. Genital fields. A & B, *Pseudocryptodrilus acanthodriloides*, holotype: A, entire male field; B, detail of same. C, *Rhododrilus littoralis*, holotype.

holonephric caudally. This condition has presumably evolved from a fully holonephric condition and may have been convergently acquired in the two species of the genus as redefined above to include *acanthodriloides* is satisfactorily homogeneous, there being no variation which is not acceptable as intrageneric.

The longitudinal orientation of the accessory genital markings, constituting tubercula pubertatis, is highly unusual in the Megascolecidae and it is, therefore, remarkable that another Tasmanian species *Oreoscolex bidiverticulatus* (q.v.) has tubercula and an almost identical genital field. Either tubercula, so rare elsewhere, have been acquired independently in the two species or a special relationship exists between the two (i.e. common descent from a species with similar tubercula). A decision between the two alternatives cannot be made, at least on present evidence, but the morphology of the *Oreoscolex* species is not inconsistent with relationship. Origin of *Oreoscolex* (Megascolecini) in south-eastern Australia from local holonephric species or from species which, like *P. acanthodriloides*, were partly holonephric and partly meronephric is quite conceivable. Irrespective of its relationships, *Pseudocryptodrilus* presents a most interesting transition from the holonephric to the meronephric condition.

Pseudocryptodrilus acanthodriloides sp. n.

Fig. 4, 26A, B, 32S; Plates 61-63. Table 12

l = 70, 67 mm, w = 3.4, 3.2 mm, s = 127, 126.

Prostomium epitanylobous with grooved peristomium. First dorsal pore 4/5. Setae 8 per segment, in regular longitudinal rows throughout. Nephropores sporadically visible in *a*, *b* and *d* lines. Clitellum annular, $\frac{1}{2}$ XIII-XVII (holotype; not developed in paratype 1). Male pores on XVIII in *a*. A pair of longitudinal ridges (tubercula pubertatis) present, each occupying *ab* and extending from just behind each male pore to the setal arc of XIX; the pair of tubercula, with the male pores, lying on a whitish glandular tumescence; a similar additional pair of tubercula extending from the male pores to the setal arc of XVII in some specimens (see field variation). Female pores a pair shortly anteromedian to *a* of XIV. Spermathecal pores 2 pairs, at the anterior margins of VIII and IX, but not in the intersegments, each on a hemispherical papilla; the ventral surface of segments VII-IX and posterior VI tumid.

TABLE 12

Intersetal distances in segment XII in *Pseudocryptodrilus acanthodriloides*

| | mm | | | | | | | |
|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 0.9 | 0.5 | 0.9 | 0.9 | 2.2 | 0.9 | 0.9 | 0.5 |
| paratype 1 | 0.9 | 0.4 | 0.8 | 0.9 | 1.8 | 0.9 | 0.8 | 0.4 |
| paratype 2 | 0.9 | 0.4 | 0.8 | 0.8 | 1.7 | 0.8 | 0.8 | 0.4 |
| paratype 3 | 0.8 | 0.4 | 0.8 | 1.0 | 1.8 | 1.0 | 0.8 | 0.4 |
| paratype 4 | 0.9 | 0.4 | 1.0 | 0.9 | 2.0 | 0.9 | 1.0 | 0.4 |

Table 12 (cont.)

| | standardized ($u = 100$) | | | | | | | |
|---------------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 12.04 | 6.02 | 11.57 | 12.04 | 28.70 | 12.04 | 11.57 | 6.02 |
| paratype 1 | 12.56 | 6.03 | 12.06 | 12.56 | 26.13 | 12.56 | 12.06 | 6.03 |
| paratype 2 | 13.83 | 6.38 | 11.70 | 12.23 | 25.53 | 12.23 | 11.70 | 6.38 |
| paratype 3 | 11.44 | 5.97 | 11.94 | 13.43 | 25.87 | 13.43 | 11.94 | 5.97 |
| paratype 4 | 11.90 | 5.71 | 12.86 | 11.90 | 27.14 | 11.90 | 12.86 | 5.71 |
| mean | 12.35 | 6.02 | 12.03 | 12.43 | 26.67 | 12.43 | 12.03 | 6.02 |
| interval/ <i>ab</i> | 2.05 | 1.00 | 2.00 | 2.06 | 4.43 | 2.06 | 2.00 | 1.00 |

Last hearts in XII (latero-oesophageal). Supra-oesophageal in VII–XII, weakly developed. Gizzard moderate, muscular but easily compressible in V. Extramural calciferous glands absent, longitudinal rugae well developed, though not forming laminae, in XV and XVI. Intestinal origin $\frac{1}{2}$ XVIII; typhlosole absent.

Nephridia: exonephric much coiled, tuft-like nephridia in II, III and IV discharging by simple ducts presetally in *c* and or *d* lines. Further posteriorly simple avesciculate nephridia discharging presetally in association with setal lines, apparently not all 4 setal lines in any one segment (*a*, *b* and *d* in the holotype in which the median-most nephridium is seen to have a preseptal funnel). In the anterior intestinal region 2 nephridia on each side, discharging presetally in *b* and *d* lines. Caudally with a pair of stomate, avesciculate holonephridia only, in each segment, discharging presetally in *d* lines (holotype and paratype 1). Holandric (funnels iridescent in X and XI); gymnorchous; seminal vesicles racemose, in IX and XII. Metagynous; small ovisacs in XIV. Prostates flattened, tubular, tortuous, in XVIII and XIX; vas deferens joining junction of gland and duct. Penial setae moderately slender but relatively short, only slightly curved, the ectal extremity flattened like the blade of an oar; ornamentation a few deep half-encircling jagged scars; length = 0.6 mm; general width of shaft = 10 μ m (paratype 3). Spermathecae, 2 pairs; diverticulum single, clavate, uniloculate.

Genital markings. Of 13 paratypes, 3 (paratypes 1, 7, 12) have male fields as the holotype, with genital markings restricted to a pair of tubercula extending from $\frac{1}{2}$ XVIII into XIX; 6 paratypes (2, 3, 4, 5, 11 and 13) have these tubercula augmented solely by a pair (unilateral only in paratypes 3, 11 (R) and 13 (L)) extending from approximately $\frac{1}{2}$ XVIII– $\frac{1}{2}$ XVII which lie in the same tumid area as the posterior pair; in 1 paratype (8) the posterior tubercula are present but there is also a mid-ventral circular presetal glandular patch in XVIII and a similar postsetal patch in XVII; 1 paratype (10) has the posterior tubercula and only the midventral presetal patch in XVIII; while 1 (paratype 6) has this condition, and also the anterior paired tubercula, and 1 (paratype 9) is similar to paratype 6 but lacks the left anterior tubercula. Most specimens have ventral tumescence in VII–IX and some in VI also.

MATERIAL EXAMINED.

Great Lake, shore under decaying gum leaves, 146°45'E. 41°55'S. Map, 8/2, Dr J. L. Hickman, 26 May 1954 – holotype TM: K355; paratypes 1, 11 and 13 BM(NH): 1973.2.31–33; paratypes 2–5 TM: W356–359; paratypes 6, 8–10 BJ: T60, 61–63; paratypes 7 and 12 AM: W5320–5321.

REMARKS. The male genital field distinguishes this species from *P. diaphanus*.

Tribe **DICHOGASTRINI** Jamieson, 1971aGenus **HICKMANIELLA** gen. nov.

DIAGNOSIS. Combined male and prostatic pores a pair on XVIII. An oesophageal and an intestinal gizzard present. Nephridia few exonephric avesculate meronephridia per segment; the medium nephridium with preseptal funnel. Prostates tubuloracemose. Spermathecae 2 pairs.

DESCRIPTION. Terrestrial. Form circular in cross section; anus terminal. Dorsal pores present. Setae numerous in each segment (> 30 in posterior segments); ventral gap large; dorsal gap recognizable anteriorly, inappreciable caudally ($zz \doteq zy$). Nephropores not externally visible. Clitellum annular; anterior to the male porophores. Combined pores of the vasa deferentia and a pair of tubuloracemose prostates one pair on XVIII. Female pores a pair on XIV. Spermathecal pores 2 pairs, in intersegments 7/8 and 8/9.

Last hearts in XII (latero-oesophageal). Subneural vessel absent. Oesophageal gizzard in V. Extramural calciferous glands absent. Intestine commencing in the vicinity of the prostate glands; with a very thick-walled intestinal gizzard preceded by a thin-walled crop; typhlosole and caeca absent. Few, exonephric, avesculate meronephridia per segment, the median nephridium in oesophageal and intestinal regions with preseptal funnel; tufting and enteronephry absent. Holandric; gymnorchous; seminal vesicles in IX and XII. Metagynous; ovisacs absent. Penial setae present. Spermathecae with clavate but internally multiloculate diverticulum.

TYPE-SPECIES. *Hickmaniella opisthogaster* sp. n.

DISTRIBUTION. Northwest Tasmania. (Monotypic.)

REMARKS. *Hickmaniella* is almost unique in the known Megascolecidae in possessing an intestinal gizzard. (*Pleionogaster* has 3 or 4 such gizzards.) This feature is characteristic of the Oriental family Moniligastridae (in which, however, Gates (1962) states the gizzards are actually oesophageal though post-ovarian), the holarctic family Lumbricidae and the palaeartic, neotropical and Ethiopian subfamily Alminae of the non-Australian family Glossoscolecidae. The Moniligastridae (Order Moniligastrida) differ from Megascolecids in many significant respects, including the single-layered clitellum, large-yolked eggs, presence of intra-septal testis sacs, location of one or two pairs of male pores in the next segment or segments respectively and absence of an anterior gizzard. The Lumbricidae are distinguished by the absence of an oesophageal gizzard, location of the male pores in or in front of segment XV, location of the clitellum far behind these pores, the exclusively lumbricine setae and in other respects. In contrast, the Glossoscolecidae, while showing their closest affinities with the Lumbricidae (*vide* Jamieson 1971d), show notable resemblances to the Megascolecidae which may indicate that they are more closely related to the latter than is any other family with the exception of the Eudrilidae. The intestinal gizzard of *Hickmaniella* constitutes a further link between the Megascolecidae and the Glossoscolecidae. Like many other common features of the two families the intestinal gizzard may have been independently acquired in each but sufficient similarities exist to

suggest that if this be the case we have here a case of parallelism in evolution stemming from a common, though remote, ancestry rather than convergence in relatively unrelated lineages of the order Haplotaxida. These similarities include the following (in addition to general characteristics of the non-Alluroidid Lumbricina of Brinkhurst and Jamieson 1971): progression from the lumbricine to the perichaetine arrangement of setae; presence of prostate-like glands in some Glossoscolecidae which resemble the prostates of the Megascolecidae; frequent presence in both families of oesophageal gizzards and the mutual possession of intestinal gizzards; location of the male pores in XVIII in some Glossoscolecidae, as in most Megascolecidae; location of these pores on the clitellum in some Megascolecidae as in many Glossoscolecidae and finally replication of the nephridia, in *Tritogenia*, as in many Megascolecids. While inclusion, on the one hand, of the Glossoscolecidae and Lumbricina in the superfamily Lumbricoidea and, on the other hand, of the Megascolecidae and Eudrilidae in the superfamily Megascolecidae is here upheld, the above-mentioned similarities between the parent families Megascolecidae and Glossoscolecidae bring the two families closer together and endorse recognition of the suborder Lumbricina as a natural grouping. The Alluroididae included in it by Brinkhurst and Jamieson (1971) relate the suborder to other Haplotaxid suborders, especially the Haplotaxina.

***Hickmaniella opisthogaster* sp. n.**

Fig. 4, 18A, 32C, D; Plates 64-66

l = 61, 59 mm, w = 5.5, 5.0 mm, s = 87, 82.

Prostomium canaliculate, tanylobous. First dorsal pore 4/5. Setae on XII 32 (holotype) or 49 (paratype 1); caudally 31 to 38 per segment; *aa* regular throughout (holotype) or becoming irregular posteriorly (paratype 1); anteriorly $aa \div 5ab$; caudally $aa \div 3ab$; *zz* varying from 2-2.5*zy*, anteriorly, to 1-1.5*zy* caudally. Nephropores not externally visible. Clitellum annular, XIII- $\frac{1}{2}$ XVII. Male pores approximately in *a* lines of XVIII, each median to a penisetal pore, on prominent dome-shaped medianly almost contiguous papillae which expand the segment longitudinally. Accessory genital markings paired, medianly conjoined oval glandular prominences with papillate or pore-like centres in approximately *b* lines in intersegments 11/12, 15/16 and 20/21, resembling the male porophores in appearance; an additional similar marking unilateral on the left, in 14/15, and on the right, in 21/22 in paratype 1. Female pores paired, anterior to setae *a* on XIV. Spermathecal pores 2 inconspicuous pairs, in 7/8 and 8/9, in *a* lines.

Last hearts in XII (hearts in X-XII latero-oesophageal, with connective from dorsal and supra-oesophageal vessel; supra-oesophageal vessel recognizable in $\frac{1}{2}$ VII- $\frac{1}{2}$ XIV, moderately developed). Oesophageal gizzard moderate, in V. Extramural calciferous glands absent. Intestine commencing in XVIII in which it is thin-walled and crop-like (holotype, paratype 1); a very large, extremely thick-walled intestinal gizzard in XIX (holotype) or XX (paratype 1); typhlosole absent. Few, exonephric, avesiculate meronephridia per segment, commencing in II; 3 on

each side in the intestinal region; median nephridium with preseptal funnel in intestinal and at least the posterior oesophageal segments; tufting and enteronephry absent.

Holandric; gymnorchous; seminal vesicles in IX and XII. Metagynous; ovisacs absent. Prostates tubuloracemose, extending laterally in, and restricted to, XVIII; with very narrow central lumen which bears narrower epithelium-lined side branches. Penial setae (holotype) 2 mature and 1 completely developed on each side; when functional 1.6–1.7 mm long, general width of shaft 31 μ m; gently or strongly curved, widened basally, the ectal tip flattened, usually curved, and with margins slightly inrolled; the ectal region of the shaft, but not the inrolled region, ornamented by numerous short, transverse minutely serrated linear markings of which there are 4 or more across the width of the seta; this ornamentation readily visible under the higher powers of the light microscope without recourse to oil immersion. Spermathecae 2 pairs, in VIII and IX; a single clavate but internally multiloculate diverticulum; the duct with a large dorsal swelling.

Genital markings. The four mature paratypes (1, 3–5) resemble the holotype in having paired intersegmental genital markings in 11/12, 15/16 and 20/21. In addition paratype 1 has unilateral genital markings in 14/15 (left) and 21/22 (right) resembling the other markings.

MATERIAL EXAMINED.

Parrawe, 145°35'E. 41°20'S. Map, 7/3, Dr J. L. Hickman, 25 Aug 1954 – holotype TM: K360; paratype 1 BM(NH): 1973.2.34; paratype 2 TM: K361. Table Cape, 145°45'E. 41°00'S. Map, 7/1, Dr J. L. Hickman, 24 Aug 1954 – paratypes 3 and 4 AM: W5322–5323. Hellyer Gorge, 145°35'E. 41°20'S. Map, 7/3, Dr J. L. Hickman, 28 May 1954 – paratype 5 BJ: T64.

Tribe MEGASCOLECINI s. Jamieson, 1971a

Genus *OREOSCOLEX* Jamieson, 1973a

DIAGNOSIS. Setae 8 per segment. A pair of combined pores of vasa deferentia and racemose or tubuloracemose prostates on XVIII. Gizzard in V. Extramural calciferous glands and typhlosole present or absent. Meronephric; anterior nephridia astomate, avesiculate and exonephric, or enteronephric, usually tufted; *caudal nephridia* avesiculate, exonephric (or enteronephric?), with numerous preseptal funnels on each side in each segment. Spermathecae in 2 or 3 segments, paired or median; diverticula uniloculate or multiloculate.

DESCRIPTION. Terrestrial worms. Form circular in cross section; anus terminal. Prostomium probolous to tanylobolous. Dorsal pores present, commencing in 3/4–20/21. Setae 8 per segment, in regular longitudinal rows throughout or becoming irregular posteriorly. Setal ratios very variable $aa : ab : bc : cd : dd = 1.9-3.4 : 1 : 1.5-5.9 : 1.6-3.4 : 3.1-12.9$; $dd : u = 0.11-0.58$; $cd =$ or $<$ never significantly $> bc$. Clitellum annular or less commonly saddle shaped, occupying 4–6½ segments, its posterior limit in XVII–XIX. Combined pores of the vasa deferentia and a pair of prostates in XVIII; the prostates externally racemose or lobulated

tubular, in the former case with or without, in the latter always with an axial lumen ; this lumen possessing side branches. Female pores a pair, anteromedian of setae *a*, in XIV. Spermathecal pores unpaired posteriorly in VII and VIII (*O. imparicystis*) or paired in 6/7, 7/8–8/9. Last hearts in XII or (*O. bidiverticulatus*) XIII ; latero-oesophageal hearts (always ?) with connectives from dorsal and supra-oesophageal vessels. Subneural vessel absent. Gizzard large, in V. Oesophagus with internal rugae, or laminae, or extramural calciferous glands, intestine commencing in XVI, XVII or XVIII ; typhlosole absent (*O. peculiaris*), rudimentary or well developed, commencing 1½–8 segments behind the intestinal origin. Meronephric ; anterior nephridia astomate, avesiculate and exonephric, or enteronephric (entering pharynx and buccal cavity), usually tufted ; caudal nephridia avesiculate, with numerous preseptal funnels on each side in each segment and exonephric or (*O. imparicystis*) possibly enteronephric. Holandric with seminal vesicles in IX and XII or rarely in XI and XII or (*O. imparicystis, leai*) XII only ; or (*peculiaris*) with anterior male organs reduced (incipiently metandric) gymnorchous (testis-sacs absent). Metagnyous (ovaries in XIII) ; ovisacs present or absent. Vasa deferentia joining the muscular duct of the prostate at midlength or entally, or the ectal extremity of the gland. Penial setae present or (*imparicystis*) absent. Spermathecae with one or two uniloculate or multiloculate diverticula.

TYPE-SPECIES. *Oreoscolex imparicystis* Jamieson 1973a. New South Wales.

DISTRIBUTION. Eastern Subregion of Australia : New South Wales and Tasmania.

Tasmanian species

O. bidiverticulatus sp. n.

**O. campestris* (Spencer, 1895)

**O. irregularis* (Spencer, 1895)

**O. leai* (Michaelsen, 1910)

O. longus sp. n.

O. peculiaris sp. n.

O. sexthecatus sp. n.

**O. wellingtonensis* (Spencer, 1895)

Other species

Four species from New South Wales (examined by the author as indicated) in addition to the type-species. The additional species accord exactly with the generic diagnosis but detailed generic characterization is not attempted here.

**Notoscolex grandis* Fletcher, 1887a 'Cotypes' AM : W.1494.

**Cryptodrilus illawarrae* Fletcher, 1889a Mt Kembla AM : W.1311.

**Cryptodrilus saccarius* Fletcher, 1887b 'Cotypes' AM : W.1372.

**Cryptodrilus simulans* Fletcher, 1889b Syntypes AM : W.1499.

* Comb. nov.

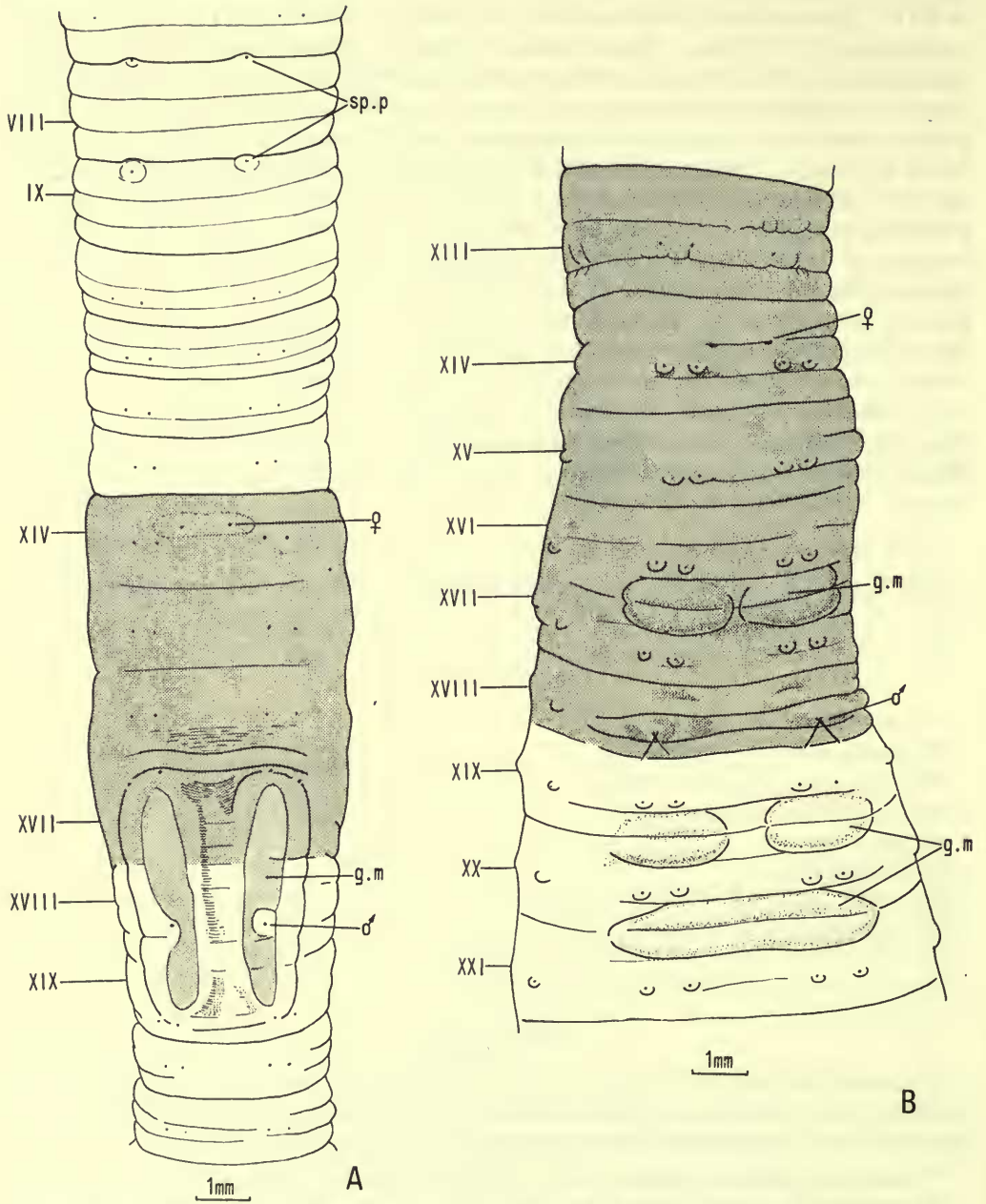


FIG. 27. Genital fields. A, *Oreoscolex bidiverticulatus*, holotype. B, *O. longus*, holotype.

KEY TO TASMANIAN SPECIES OF *OREOSCOLEX*

- 1 Spermathecal diverticula uniloculate 2
 - Spermathecal diverticula multiloculate 5
 2 Male pores in *ab* on XVIII 3
 - Male pores median to *a* on XVIII 4
 3 Reniform extramural calciferous glands in XV and XVI. Fig. 27A *O. bidiverticulatus* sp. n.
 - Extramural calciferous glands absent. Fig. 27B *O. longus* sp. n.
 4 Male pores almost contiguous medianly, on a circular porophore median to *b* lines.
 A median genital marking in 20/21. Fig. 28C *O. irregularis* (Spencer, 1895)
 - Male pores shortly median to *a* lines on a transverse oval porophore which extends
 lateral of *b* lines and impinges on adjacent segments. Fig. 28B *O. peculiaris* sp. n.
 5 Spermathecae 3 pairs. Fig. 29A *O. sexthecatus* sp. n.
 - Spermathecae 2 pairs 6
 6 A pair of eye-like genital markings present in *ab* in 17/18 or XVII and in each of
 several intersegments behind XVIII. Fig. 28A *O. campestris* (Spencer, 1895)
 - Eye-like or other paired genital markings absent 7
 7 A large median transverse genital marking in each of intersegments 15/16-18/19,
 extending approximately to *b* lines. That in 18/19 indistinct; that in 17/18
 indistinct posteriorly *O. leai* (Michaelsen, 1910)
 - A large midventral glandular pad in 19/20 or 20/21 extending laterally beyond *b*
 lines. Fig. 29B *O. wellingtonensis* (Spencer, 1895)

Oreoscolex bidiverticulatus sp. n.

Fig. 3, 27A, 32J.; Plate 67. Table 13

l = 150, 106 mm, w = 4.9, 4.2 mm, s = 118, 141.

Prostomium epilobous $\frac{1}{3}$, open. First dorsal pore 4/5. Setae 8 per segment in regular longitudinal rows throughout. Nephropores not visible. Clitellum annular ($\frac{1}{2}$ XIII dorsally) XIV-XVII; not developed in paratype 1. Male pores on XVIII, in *ab*, on long tubercula pubertatis which extend from the setal arc of XVII to that of XIX; a glandular depression occupying the space between the tubercula. Female pores paired anteromedian of *a* on XIV. Spermathecal pores 2 pairs, in 7/8 and 8/9, on small papillae in *a*.

TABLE 13

Intersetal distances in segment XII in *Oreoscolex bidiverticulatus*

| | mm | | | | | | | |
|---------------------|--------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 1.8 | 0.6 | 1.7 | 1.1 | 4.4 | 1.1 | 1.8 | 0.5 |
| paratype 1 | 1.5 | 0.5 | 1.4 | 1.0 | 4.0 | 1.0 | 1.4 | 0.5 |
| | standardized (<i>u</i> = 100) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 14.02 | 4.58 | 12.94 | 8.63 | 33.42 | 8.63 | 13.75 | 4.04 |
| paratype 1 | 13.54 | 4.31 | 12.31 | 8.92 | 35.38 | 8.92 | 12.31 | 4.31 |
| mean | 13.78 | 4.45 | 12.63 | 8.78 | 34.40 | 8.78 | 13.03 | 4.18 |
| interval/ <i>ab</i> | 3.10 | 1.00 | 2.84 | 1.97 | 7.73 | 1.97 | 2.93 | 0.94 |

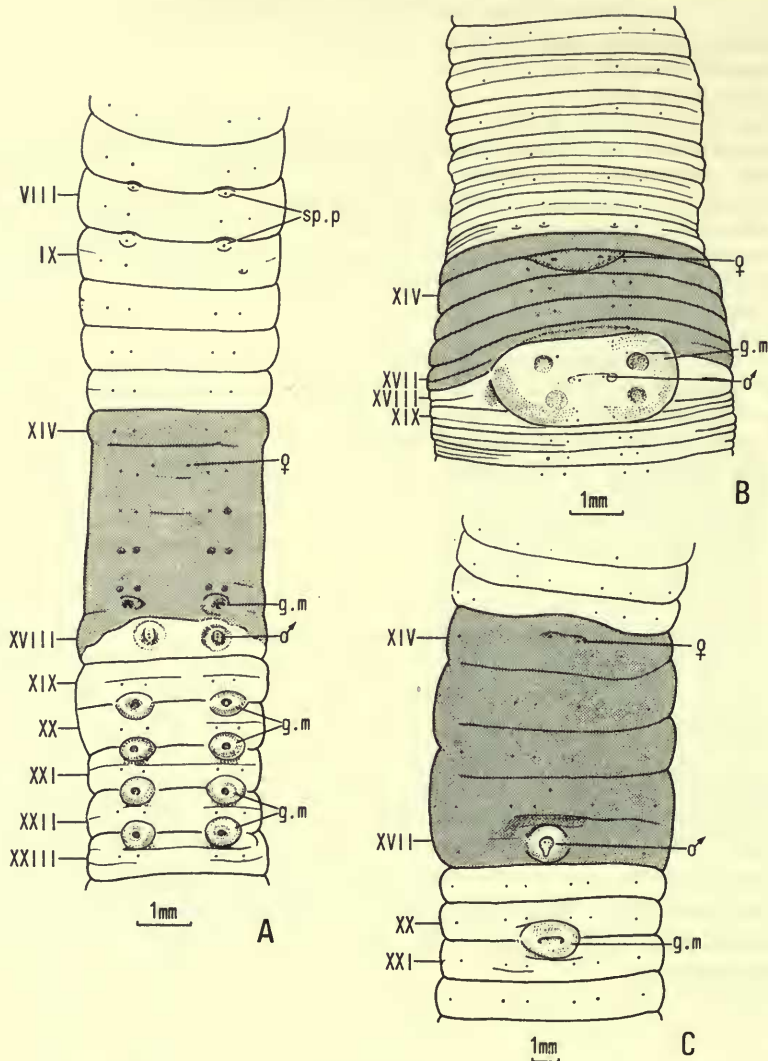


FIG. 28. Genital fields. A, *Oreoscolex campestris*, specimen 1. B, *O. peculiaris*, holotype. C, *O. irregularis*, specimen 1.

Last hearts in XIII (latero-oesophageal); supra-oesophageal in VII- $\frac{1}{2}$ XIV, moderately developed. Gizzard large and firm, in V, with anterior rim. A pair of large reniform extramural calciferous glands in each of segments XV and XVI, each joined over most of its height to the lateral wall of the oesophagus, free for only a short extent dorsally, and ventrally, and with a wide communication with the central lumen of the oesophagus; sessile, lacking a duct. Each gland with numerous radial longitudinal laminae which span the lumen of the free part of the gland.

Intestinal origin XVIII but no constricted oesophageal valve at 17/18; deep dorsal typhlosole commencing in XXIII, continued anteriorly as a slight ridge to XIX. In II-VII with a pair of exonephric tufted nephridia with numerous anteriorly running ducts (always ?) opening in the same segment; the tufts largest in V and VI and very large in V. Few exonephric meronephridia on each side in succeeding segments until in XV and XVI there are very deep lateral bands of exonephric nephridia, each with several tubules, with the appearance of transverse tufts; meronephridia again few in more posterior segments; caudally numerous exonephric meronephridia on each side dependent from the anterior septum and with many preseptal funnels in a transverse row. Holandric (funnels iridescent in X and XI); seminal vesicles racemose, in IX and XII. Metagynous; ovisacs present. Prostates racemose; restricted to an enlarged segment XVIII: with (paratype 2) branched internal ducts and lacking a central lumen. Penial seta almost straight, filiform, tapering ectally, lacking ornamentation; the tip broadened, irregular and bent relative to the axis; length left seta = 1.1 mm, general width of shaft = 12 μ m (holotype). Spermathecae 2 pairs; each with 1 (paratype 1) or 2 (holotype) (inseminated) clavate, uniloculate diverticula.

MATERIAL EXAMINED.

Fern Glade, Emu River, Burnie, 145°55'E. 41°05'S. Map, 7/2, Dr J. L. Hickman, 24 Aug 1954 - holotype TM: K362; paratype 1 BM(NH): 1973.2.35; paratype 2 BJ: T65.

REMARKS. Intraspecific variation from one to two diverticula on a spermatheca is highly unusual in the Oligochaeta but there is no doubt that the holotype and paratypes are conspecific. Location of last hearts in XIII and of calciferous glands in XV and XVI, together with the configuration of the genital markings, is diagnostic of this species.

Oreoscolex campestris (Spencer, 1895)

Fig. 3, 28A, 32K; Plates 68-72. Table 14

Cryptodrilus campestris Spencer, 1895: 39, Pl. II, fig. 13-15.

Notoscolex campestris; Michaelsen, 1900: 192; Jamieson, 1971c: 78.

l = 87, 82 mm, w = 3.5 mm, s = 109, 114 (specimens 1 and 2). (l = 50-75 mm, w = 3 mm, Spencer.)

TABLE 14

Intersetal distances in segment XII in *Oreoscolex campestris*

| | mm | | | | | | | |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| | aa | ab | bc | cd | dd | dc | cb | ba |
| specimen 1 | 1.4 | 0.4 | 2.1 | 1.1 | 1.6 | 1.1 | 2.2 | 0.4 |
| specimen 2 | 1.5 | 0.5 | 2.5 | 1.0 | 1.1 | 1.0 | 2.5 | 0.4 |
| specimen 3 | 1.1 | 0.3 | 1.4 | 0.8 | 1.0 | 0.9 | 1.6 | 0.3 |
| specimen 4 | 1.6 | 0.5 | 2.4 | 1.1 | 1.6 | 1.2 | 2.3 | 0.5 |
| specimen 5 | 1.4 | 0.5 | 2.3 | 1.0 | 1.4 | 1.0 | 2.5 | 0.4 |

Table 14 (*cont.*)

| | standardized ($n = 100$) | | | | | | | |
|---------------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| specimen 1 | 13.79 | 4.14 | 20.00 | 11.03 | 15.17 | 10.34 | 21.38 | 4.14 |
| specimen 2 | 14.19 | 4.73 | 23.65 | 9.46 | 10.81 | 9.46 | 23.65 | 4.05 |
| specimen 3 | 15.00 | 4.00 | 19.00 | 11.00 | 14.00 | 12.00 | 22.00 | 4.00 |
| specimen 4 | 14.19 | 4.52 | 21.29 | 9.68 | 14.19 | 10.97 | 20.64 | 4.52 |
| specimen 5 | 13.50 | 4.73 | 21.60 | 9.45 | 13.50 | 9.45 | 23.63 | 4.05 |
| mean | 14.13 | 4.42 | 21.11 | 10.12 | 13.53 | 10.44 | 22.26 | 4.15 |
| interval/ <i>ab</i> | 3.20 | 1.00 | 4.78 | 2.29 | 3.06 | 2.36 | 5.04 | 0.94 |

Prostomium indistinctly tanylobous, canaliculate (epilobous $\frac{1}{3}$, Spencer). First drosal pore 4/5 (3/4 Spencer). Setae 8 per segment in regular longitudinal rows throughout, *dd* narrowing caudally. Nephropores not externally visible. Clitellum annular, XIII- $\frac{1}{2}$ XVIII (XIII-XVII, saddle shaped in XVII, Spencer). Male pores in or median to *a* on XVIII on a pair of low circular porophores; each pore preceded and succeeded, on the porophore, by the pore of a penisetal follicle. Paired eye-like genital markings occupying *ab* at 17/18, 19/20, 20/21, 21/22 (specimens, 1, 2) and 22/23 (specimen 1). (Anterior XVII, 18/19 and 19/20, Spencer.) Female pores, paired, anteromedian of *a* on XIV. Spermathecal pores two pairs on hemispheroidal papillae at the anterior margins of VIII and IX, just lateral of *a*. Last hearts in XII (latero-oesophageal). Supra-oesophageal in VIII- $\frac{1}{2}$ XIII, well developed. Gizzard firm and very large, in V. Extramural calciferous glands absent; oesophagus internally rugose in ?, X-XV. Intestinal origin $\frac{1}{2}$ XVI (XVI, Spencer); a very deep \perp -shaped dorsal typhlosole commencing in XIX. Nephridia: very large pharyngeal tufts in IV and V; smaller anterior tufts apparently exonephric; caudally with a transverse row of numerous preseptal funnels on each side, the nephridia exonephric. Holandric (funnels iridescent in X and XI); gymnorchous; seminal vesicles racemose, in IX and XII. Metagynous; ovisacs present in XIV (?).

Genital markings in 18 specimens of *Oreoscolex campestris*

| Genital markings | Specimen | Total number of specimens |
|------------------|------------------------------|---------------------------|
| 16/17 | 16 | 1 |
| 17/18 | 1-18 | 18 |
| 18/19 | 5, 13, 14 (L), 18 | 4 |
| 19/20 | 1-18 | 18 |
| 20/21 | 1-18 | 18 |
| 21/22 | 1-3, 7-11, 12 (L), 14, 16-18 | 13 |
| 22/23 | 1 | 1 |

Prostates restricted to an enlarged segment XVIII; broad flattened smooth lobes, each with 3 serial portions joined together by narrow alternating bands and probably originating from a tubular type; the two glands completely encircling and adpressed to the intestine and to each other middorsally; central lumen very narrow, with few lateral branches; vas deferens joining the muscular prostate duct at its junction with the gland. Penial setae gently curved, moderately stout, slightly tapering ectally, the tip truncated and fluted by longitudinal grooves; the ectal region

ornamented with the exception of the vicinity of the tip ; ornamentation consisting of numerous regularly spaced circlets of large acute flattened spines the bases of which are in contact with adjacent spines in the circlet, some spines bifid, most simple : length of a functional seta = 0.34 mm ; general width of shaft = 13 μ m (2 specimens). Spermathecae 2 pairs ; diverticulum single, sessile, multiloculate.

TYPE-LOCALITY. Parattah. Map, 14/1.

MATERIAL EXAMINED.

Parattah, under moss, in earth at base of cliff, also in earth along edges of logs, 147°25'E. 42°20'S. Map, 14/1, Professor V. V. Hickman and Dr J. L. Hickman, 18 Aug 1954 - specimens 1, 3-6 TM : K363-367 ; specimens 2, 7-11 BM(NH) : 1973.2.36-41 ; specimens 12-16 AM : W5324-5328 ; specimens 17 and 18 BJ : T66-67.

REMARKS. The syntypes, in the National Museum of Victoria, G48, are desiccated, and yield no significant taxonomic information.

Oreoscolex irregularis (Spencer, 1895)

Fig. 3, 28C, 32L. Table 15

Cryptodrilus irregularis Spencer, 1895 : 34-35, Pl. 1 fig. 1-3.

Notoscolex irregularis ; Michaelsen, 1900 : 191 ; Jamieson, 1971c : 79.

l = 194, 195 mm, w = 9 mm, s = 120, 136 mm (specimens 1 and 2 throughout this account).

Prostomium epilobous $\frac{2}{3}$ (ca. $\frac{1}{2}$, Spencer) canaliculate, open, parallel-sided. First dorsal pore 4/5. Setae 8 per segment ; all rows becoming irregular near the caudal extremity (or from XIV, Spencer) ; setae *a* and *b* absent in XVIII although their loci are lateral of the male pores. Clitellum annular XIV-XVIII ; some clitellar modification dorsally throughout XIII ; dorsal pores occluded, setae and intersegmental furrows retained though fainter than elsewhere. Male pores minute, almost contiguous medianly, in a circular depression (with, in specimen 1, posterior extension, i.e. pyriform), on a low median circular porophore which almost fills segment XVIII longitudinally and extends to *a* lines laterally. A transversely oval median accessory genital marking with crater-like centre, in 20/21, extending slightly lateral of *a* lines and almost reaching the setal arcs of XX and XXI. Female pores a pair, antero-median to setae *a* of XIV. Spermathecal pores not demonstrable externally ; from internal dissection, well median of *a* lines if not medianly united, but said by Spencer to be in *a* lines.

TABLE 15

Intersetal distances in segment XII in *Oreoscolex irregularis*

| | mm | | | | | | | |
|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| specimen 1 | 2.2 | 1.1 | 1.9 | 1.7 | 14.4 | 1.7 | 1.9 | 1.1 |
| specimen 2 | 2.6 | 1.3 | 1.7 | 1.2 | 15.0 | 1.2 | 1.7 | 1.3 |
| specimen 3 | 2.6 | 1.3 | 2.1 | 2.6 | 15.7 | 2.6 | 2.0 | 1.3 |
| specimen 4 | 2.8 | 0.9 | 1.5 | 2.1 | 13.9 | 1.9 | 1.5 | 0.9 |

Table 15 (cont.)

| | standardized ($u = 100$) | | | | | | | |
|---------------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| specimen 1 | 8.49 | 4.11 | 7.40 | 5.58 | 55.35 | 6.58 | 7.12 | 4.11 |
| specimen 2 | 9.86 | 4.93 | 6.58 | 4.66 | 57.54 | 4.66 | 6.58 | 4.93 |
| specimen 3 | 8.53 | 4.27 | 6.87 | 8.53 | 52.14 | 8.53 | 6.64 | 4.27 |
| specimen 4 | 10.88 | 3.63 | 5.86 | 8.37 | 54.41 | 7.25 | 5.86 | 3.63 |
| mean | 9.44 | 4.24 | 6.68 | 7.04 | 54.86 | 6.76 | 6.55 | 4.24 |
| interval/ <i>ab</i> | 2.23 | 1.00 | 1.58 | 1.66 | 12.94 | 1.59 | 1.54 | 1.00 |

Dorsal vessel single, continuous onto the pharynx. Last hearts in XII (hearts in X–XII latero-oesophageal, with dorsal and larger supra-oesophageal connectives); supra-oesophageal in VIII– $\frac{1}{2}$ XIII, well developed. Gizzard large but easily compressible in V; oesophagus dilated and vascularized and internally rugose in IX–XV (–XIII, Spencer), but calciferous glands absent. Intestinal origin posterior in XVII (in XVIII, Spencer); typhlosole rudimentary, commencing in XXV; muscular thickening and caeca absent. Nephridia: large tufts in II–IX, especially large in II and III; those in V–IX exonephric by composite ducts in their own segments; those in IV sending composite ducts forwards, to the vicinity of the pharynx or, II and III, of the buccal cavity; some tufting of median nephridia persists to XIII and in II–XIII there are no nephridia lateral to the median nephridium. In XIV the nephridia begin to spread laterally to form a parietal band of astomate, avesiculate, exonephric micromeronephridia and by XIV these bands are well developed and so dense as to have the appearance of transversely expanded tufts, though with numerous separate parietal ducts in the same segment. Caudally with transverse bands of 30–40 avesiculate exonephric parietal micromeronephridia on each side, each with a minute, preseptal funnel.

Holandric (funnels iridescent in X and XI); gymnorchous; seminal vesicles racemose in IX and XII (XII only, Spencer). Metagynous; ovisacs present. Prostates each a broad tongue-shaped lobe, with surface lobulations, racemose in appearance but internally with single axial duct which gives off lateral branches into the gland; double vas deferens joining the middle of the long muscular external duct. Penial setae absent. Spermathecae 2 pairs, duct about as long as and clearly demarcated from the ampulla, joined near its ectal end within the body wall by a single clavate (inseminated) diverticulum; the duct entering the body wall at the lateral border of the ventral nerve cord, near the midventral line.

Genital markings. Constant though not always equally developed. Crater on male porophore is pyriform in specimen 4 as in specimen 1.

TYPE-LOCALITY. Table Cape. (Types in NMV, not seen.)

MATERIAL EXAMINED.

Table Cape, 145°45'E. 41°00'S. Map, 7/1, Dr J. L. Hickman, 24 Aug 1954 – specimens 1 and 2 TM: K368–369; specimen 3 BJ: T68; specimen 4 BM(NH): 1973.2.42.

Oreoscolex leai (Michaelsen, 1910)

Notoscolex leai Michaelsen, 1910: 99–102, Fig. 18, 19.

l = 310 mm, w = 7 mm, s = 152.

Prostomium prolobous or possibly slightly and broadly pro-epilobous. Setae unusually delicate, in the mid- and hindbody, with the exception of the hind fourth, regularly arranged and widely paired, $aa : ab : bc : cd : dd = 1.6 : 1 : 2 : 1 : 8$. Further anteriorly, near the male pores each ventral pair is much narrowed but the lateral pair is not (in XIX $aa \doteq 5ab$). Clitellum midventrally insunk, though not saddle-shaped, in $\frac{1}{2}$ XIII–XIX. Male pores on small, almost circular papillae on XVIII in ab , about one-twelfth of the circumference apart. Large unpaired, mid-ventral rounded hexagonal genital markings, extending laterally approximately to setal lines b and leaving only a small region of the segment between them in 15/16, 16/17, 17/18 and 18/19; the most posterior, in 18/19, only indistinct, that in 17/18 posteriorly indistinctly demarcated. Female pores indicated by a rather long, transverse furrow anteriorly in XIV. Spermathecal pores 2 pairs, in 7/8 and 8/9, those of a pair about one-tenth of the circumference apart, in line with the male pores (in setal lines ab ?).

Gizzard large in V; oesophagus only slightly swollen segmentally; calciferous glands absent. Intestine, at least in the first 24 segments, spiral. Dorsal vessel single. Last hearts in XII. Meronephric; a large number of nephridial tubules in each segment; in the forebody, in the region of thickened septa, nephridia less numerous and aggregated ventrally to give a spurious appearance of holonephridia. Holandric; 2 pairs of sperm funnels, in X and XI; seminal vesicles racemose in XII. Prostates slenderly tongue-shaped, long, narrow and flattened; tubuloracemose, with a central lumen extending almost the whole length of the glandular part; the mass of the glandular part composed of numerous adpressed parts with apparently epithelial ducts opening into the main duct. Vasa deferentia of a side entering the internal duct of the prostate separately at its distal fourth. Penial setae approx. 2 mm long and, almost throughout, 20 μ m wide; gently and simply curved, ectally simply and slenderly pointed. Distinct ornamentation absent.

Spermathecae 2 pairs, duct short, conical, bearing a multiloculate diverticulum with 4 or 5 sperm chambers.

TYPE-LOCALITY. Tasmania, vicinity of Hobart.

MATERIAL EXAMINED.

None available.

Oreoscolex longus sp. n.

Fig. 3, 27B, 32N, O; Plates 73–80. Table 16

l = 325, 215 mm, w = 6.0, 5.2 mm, s = 210, 231.

Prostomium epilobous $\frac{1}{2}$, open. Dorsal pores indistinct; the first in 20/21. Setae 8 per segment, in regular longitudinal rows throughout. Nephropores not visible. Clitellum annular, $\frac{1}{2}$ XIII–XVIII, weaker ventrally in bb (holotype), not developed in paratype 1. Male pores at the centres of prominent transversely conjoined papillae occupying ab on XVIII; two long conspicuous penial setae projecting in the vicinity of each pore. Accessory genital markings: large oval paired pads in 16/17 and 19/20 extending both laterally and medianly of ab , a smaller pair in 9/10

in *ab*, and a median ventral pad in 20/21 (holotype); or median pads similarly extending laterally of *b* in each of intersegments 12/13-16/17 and paired markings in 19/20 and 20/21 (paratype 1). Female pores a pair anteromedian of *a*, on XIV. Spermathecal pores 2 pairs, in 7/8 and 8/9, on small papillae in *a*.

TABLE 16

Intersetal distances in segment XII in *Oreoscolex longus*

| | mm | | | | | | | |
|---------------------|--------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| paratype 1 | 1.3 | 0.6 | 1.7 | 1.2 | 4.5 | 1.3 | 1.7 | 0.5 |
| paratype 2 | 1.4 | 0.6 | 1.9 | 1.2 | 5.4 | 1.4 | 1.8 | 0.6 |
| paratype 3 | 1.9 | 0.7 | 2.1 | 1.8 | 4.5 | 1.8 | 2.1 | 0.7 |
| paratype 4 | 1.7 | 0.6 | 2.1 | 1.4 | 5.0 | 1.4 | 1.6 | 0.6 |
| paratype 5 | 1.8 | 0.6 | 2.0 | 1.3 | 5.0 | 1.3 | 1.9 | 0.6 |
| | standardized (<i>u</i> = 100) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| paratype 1 | 10.19 | 4.41 | 13.50 | 9.37 | 34.99 | 10.19 | 13.22 | 4.13 |
| paratype 2 | 9.91 | 4.44 | 13.37 | 8.39 | 37.14 | 9.91 | 12.40 | 4.44 |
| paratype 3 | 11.87 | 4.57 | 13.70 | 11.42 | 28.77 | 11.42 | 13.70 | 4.57 |
| paratype 4 | 11.92 | 3.97 | 14.44 | 9.97 | 34.87 | 9.97 | 10.88 | 3.97 |
| paratype 5 | 12.40 | 3.95 | 13.85 | 8.93 | 34.63 | 8.93 | 13.37 | 3.95 |
| mean | 11.26 | 4.27 | 13.77 | 9.62 | 34.08 | 10.08 | 12.71 | 4.21 |
| interval/ <i>ab</i> | 2.64 | 1.00 | 3.23 | 2.25 | 7.99 | 2.36 | 2.98 | 0.99 |

Last hearts in XII (latero-oesophageal; connective to dorsal vessel not recognizable). Supra-oesophageal in (?)— $\frac{1}{2}$ XIII; well developed. Gizzard in V but septa 5/6 and 6/7 very delicate and with more posterior septa deflected far posteriorly by it; very strong and firm, fusiform with anterior rim. Extramural calciferous glands absent. Oesophagus especially vascular in XI-XIII; in IX-XIII with higher internal lamellae which are most numerous and most slender in XI and XII in which they occlude the oesophageal lumen though they do not fuse centrally. Intestinal origin XVII (holotype), or XVIII (paratype 1); a deep laminar dorsally typhlosole (at first rudimentary) beginning in XXIV. Nephridia all avesiculate: anterior nephridia indistinct; no enteronephry detected. From approximately XIV posteriorly there is a plumose median nephridium on each side which has a single pre-septal funnel but which discharges exonephrically by several ducts which converge to the body wall pre-septally in *a*; other astomate meronephridia discharge pre-septally in *b*, *c* and in *d* or above *d*. Caudally there are several (> 10) pre-septal funnels on each side in each segment, located in *ab*; the meronephridia being exonephric (holotype).

Holandric (funnels iridescent in X and XI); gymnorchous; seminal vesicles small, racemose, in XI and XII (holotype; not developed in paratype 1). Metagynous; ovisacs present. Prostates very tortuous, slender, lobulated tubes in XVIII-XX with narrow central lumen. Vasa deferentia of a side running together then separating before joining the muscular prostatic duct near its ental limit. Penial setae curved, moderately stout, slightly tapering ectally, the tip flattened and widened

to form a blade with almost straight transverse or oblique somewhat crenulated end ; ectal region, with the exception of the blade, ornamented ; ornamentation consisting of numerous regularly spaced circlets of large acute spines, the circlets interrupted so that the spines are in groups, of approximately 5, slightly separated from other groups in the same circlet ; some spines bifid, most simple (holotype, paratype 1, 7) ; length of right seta = 1.6, 2.6 mm (holotype, paratype 1) ; general width of shaft = 18, 25, 19 μ m (holotype, paratypes 1, 7). Spermathecae 2 pairs ; diverticulum (inseminated) digitiform but ectally widening greatly to form a bulbous swelling over the pore ; no distinct duct developed.

Genital markings in 8 specimens of *O. longus*

| Genital markings | Specimen | Total number of specimens |
|-----------------------------------|---------------------|---------------------------|
| Paired in 9/10 | H P2-7 | 7 |
| Paired (often conjoined) in 12/13 | P1 | 1 |
| 13/14 | P1 | 1 |
| 14/15 | P1 | 1 |
| 15/16 | P1 | 1 |
| 16/17 | H P1-3, 5-7 | 7 |
| 19/20 | H P1-7 | 8 |
| 20/21 | H P1-3, P5-6, 7 (L) | 7 |
| Median in 21/22 | P5 | 1 |

H=holotype; P=paratype.

MATERIAL EXAMINED.

Cox's Bight, 146°15'E. 43°30'S. Map, 18/1, Tasmanian Biological Survey, Mr C. D. King, Nov 1938 and Jun 1939 - holotype TM : K370 ; paratypes 1 and 5 BM(NH) : 1973.2.43-44 ; paratypes 2-4 TM : K371-373 ; paratype 6 AM : W5329 ; paratype 7 BJ : T69.

REMARKS. *O. longus* is identifiable by the distinctive genital field and the bulbous swelling of the spermatheca over its pore with an accompanying short, digitiform diverticulum.

Oreoscolex peculiaris sp. n.

Fig. 3, 28B, 32M ; Plates 81-82. Table 17

l = 46, 60 mm, w = 5.7, 6.0 mm, s = 146, 125.

Prostomium epilobous $\frac{1}{3}$ with suggestions of a tanylobous condition. First dorsal pore (5/6 ?), 6/7. Setae 8 per segment, *b*, *c* and *d* irregular posteriorly ; *ab* narrowing and slightly nearer to the ventral midline as XVIII is approached from anteriorly or posteriorly, but absent in XVIII. Nephropores not visible, clitellum annular XIII-XVII. Male pores a pair in XVIII median to setal lines *a*, at the centre of a large oblong-oval pad-like glandular protuberance which, basally at least, includes the setal arcs (and setae *ab*) of XVII and XIX and extends laterally almost to mid *bc*, 4 circular, translucent pore-like markings present on the pad but discernible with difficulty, two at the anterior and two at the posterior limit of XVIII, with centres shortly lateral of *b* lines (holotype, paratype 1 ; similar in paratypes 2-5 ; less

developed and tending to be divided in two medianly in paratypes 6-8). Female pores a pair anterior and slightly median to *a* on XIV. Spermathecal pores difficult to observe, 2 pairs of small pores in *a* at 7/8 and 8/9.

TABLE 17

Intersetal distances in segment XII in *Oreoscolex peculiaris*

| | mm | | | | | | | |
|---------------------|--------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 1.3 | 0.4 | 3.7 | 1.0 | 3.0 | 1.1 | 3.4 | 0.4 |
| paratype 1 | 1.6 | 0.6 | 4.3 | 1.6 | 2.5 | 1.8 | 4.2 | 0.6 |
| paratype 5 | 0.8 | 0.6 | 2.1 | 1.2 | 1.9 | 1.3 | 2.1 | 0.6 |
| paratype 6 | 0.7 | 0.6 | 3.3 | 2.2 | 1.8 | 2.1 | 3.4 | 0.6 |
| | standardized (<i>u</i> = 100) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 8.96 | 2.99 | 25.87 | 6.97 | 20.90 | 7.96 | 23.38 | 2.99 |
| paratype 1 | 9.17 | 3.33 | 25.00 | 9.17 | 14.58 | 10.42 | 24.58 | 3.75 |
| paratype 5 | 7.48 | 5.44 | 19.72 | 11.56 | 17.68 | 12.24 | 20.40 | 5.44 |
| paratype 6 | 4.87 | 3.90 | 22.40 | 15.10 | 12.18 | 14.12 | 23.38 | 3.90 |
| mean | 7.62 | 3.92 | 23.25 | 10.70 | 16.34 | 11.19 | 22.94 | 4.02 |
| interval/ <i>ab</i> | 1.94 | 1.00 | 5.93 | 2.73 | 4.17 | 2.85 | 5.85 | 1.03 |

Last hearts in XII (latero-oesophageal; connective to dorsal vessel a delicate filament). Supra-oesophageal in (?)— $\frac{1}{2}$ XIV, well developed. Gizzard large and firm, with anterior rim, in V. Extramural calciferous glands absent; vascularized with high rugae in VIII-XIV, at first few; especially numerous in XII-XIV in which they form flattened papillae. Intestinal origin XVII; spiral from XX posteriorly; typhlosole absent. Nephridia (holotype): first nephridia large enteronephric (pharyngeal) tufts in V; large tufts, decreasing in size posteriorly, in VI-VIII, those in VI probably enteronephric, the others apparently exonephric. Small exonephric tufts in IX-XII. In XIII and XIV the individual tubules and ducts of the tufts have dissociated so that the meronephridia begin to spread laterally and by XV numerous discrete micromeronephridia form bands extending far laterally, the nephridia being astomate, avesculate and exonephric; approximately 15 micromeronephridia on each side in each segment shortly behind the prostates. Abruptly, at the sixty-ninth segment, several dorsal nephridia which are dependent from the anterior septum, become enlarged and acquire, each, a preseptal funnel, giving several funnels laterally on each side in each segment; a single preseptal funnel also is present on the medianmost nephridium (holotype; caudal arrangement confirmed in paratype 3). Holandric (but incipiently metandric?) funnels in X and XI but iridescent in XI only; gymnorchous; seminal vesicles racemose, in IX (holotype) and XII (holotype, paratype 1). Metagynous; ovisacs absent. Prostates tubuloracemose, running laterally in and restricted to XVIII; vas deferens joining the gland near its ectal end. Penial setae filiform, the tip forming a small rounded button, ornamentation absent but longitudinal furrows present; length of left seta

= 0.8 mm, general width of shaft = 12 μ m (holotype). Spermathecae 2 pairs; diverticulum single, clavate, uniloculate.

MATERIAL EXAMINED.

Mt Wellington, Shoobridge Bend Track, approx. 580 m, in loam and clay in eucalypt-fern woodland, 147°15'E. 42°55'S. Map, 14/4, Dr B. G. M. Jamieson and Mr E. A. Bradbury, 19 Aug 1971 - holotype TM : K374; paratypes 1 and 3 BM(NH) : 1973.2.45-46; paratypes 2, 6 and 7 TM : K375-377; paratype 4 AM : W5330; paratype 5 BJ : T70.

REMARKS. Location of the male pores median to setal lines *a* on a midventral, pad-like glandular protuberance which bears pore-like genital markings, diagnoses this species. The specific name refers to the restriction of multiple caudal nephrostomes to a dorsal situation distinct from the ventral funnel. Other peculiarities are indicated in the generic definition.

Oreoscolex sexthecatus sp. n.

Fig. 3, 29A, 32P, Q; Plates 83-86. Table 18

1? (posterior amputee), w = 6.3 mm, s? (holotype).

Prostomium epilobous $\frac{5}{8}$. First dorsal pore 5/6. Setae 8 per segment; *b*, *c* and *d* irregular posteriorly. Nephropores not visible. Clitellum not developed. Male pores in *b* on ovoid papillae which extend from *a* lateral of *b*. Paired eye-like genital markings with centres in *b*, radius *ab* or less, in 13/14, 14/15, 15/16, 16/17 and 19/20. Female pores paired on small papillae anterior and slightly median of *a* on XIV. Spermathecal pores 3 pairs, in 6/7-8/9, in *b* lines.

TABLE 18

Intersetal distances in segment XII in *Oreoscolex sexthecatus*

| | mm | | | | | | | |
|---------------------|--------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 1.6 | 0.6 | 1.8 | 1.7 | 6.3 | 1.9 | 1.8 | 0.6 |
| | standardized (<i>u</i> = 100) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| holotype | 9.73 | 3.54 | 11.06 | 10.62 | 38.94 | 11.50 | 11.06 | 3.54 |
| interval/ <i>ab</i> | 2.75 | 1.00 | 3.12 | 3.00 | 11.00 | 3.25 | 3.12 | 1.00 |

Last hearts in XII (latero-oesophageal, with filamentous connective to dorsal vessel). Supra-oesophageal in $\frac{1}{2}$ VIII- $\frac{1}{2}$ XIII, well developed. Gizzard large and firm, in V; preceded in IV by a large, thin-walled proventriculus. Extramural calciferous glands absent. Oesophagus vascular in VII-XVI, with internal rugae, though these are poorly developed in VII-IX and nowhere form lamellae, their greatest development, as flattened papillae, being in XIV. Intestinal origin XVII (? macerated); typhlosole? Nephridia: astomate, avesiculate, exonephric meronephridia in II to the amputation at about XXV; very slender ducts entering the

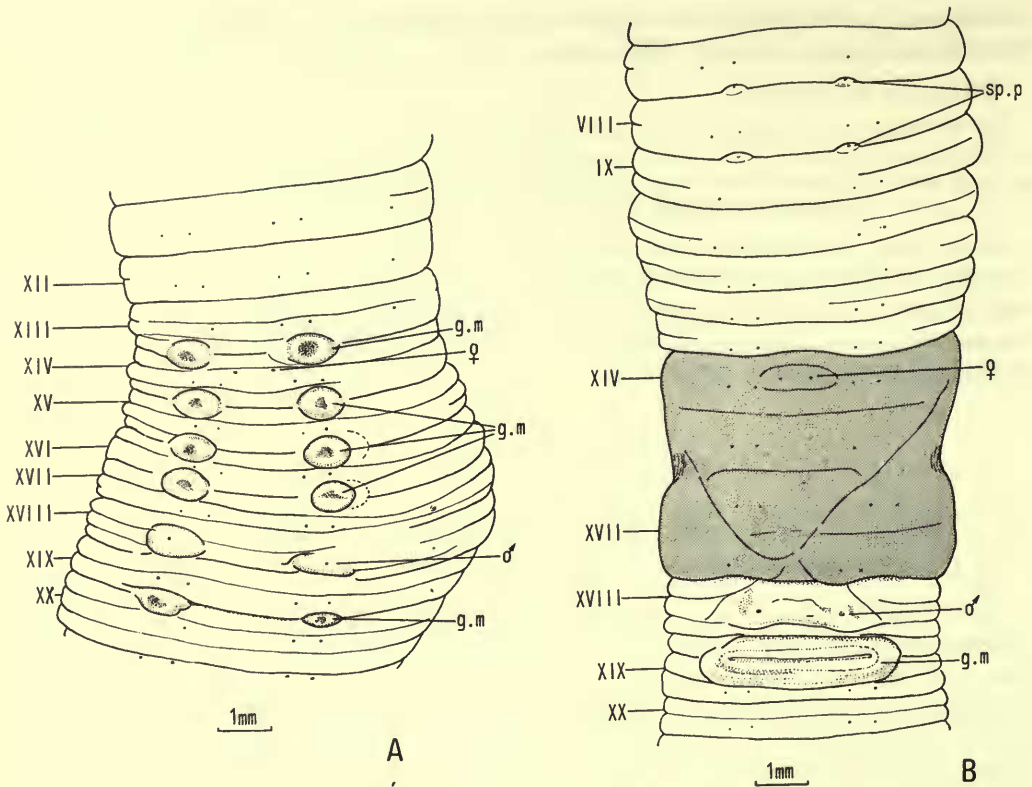


FIG. 29. Genital fields. A, *Oreoscolex sexthecatus*, holotype. B, *O. wellingtonensis*, 14/5, specimen 1.

body wall in front of setal follicles *a*, *b*, *c* and *d* and near middorsal: the *a* and *b* and, anteriorly, the *c* and *d* nephridia forming spiral-looped aggregations with the appearance of tufts, but presetal ducts remaining separate. A posterior fragment which corresponds in appearance with the posterior amputee (there being only one other, very small, worm in the sample) has 5 presepatal funnels on each side in caudal segments, the nephridia remaining exonephric. Holandric (funnels and free sperm masses but no iridescence observed); gymnorchous; very large racemose seminal vesicles in IX and XII. Metagynous; ovisacs in XIV. Prostates racemose, curved linear, extending through several segments, the surface deeply lobulated; the central lumen moderately wide with many side branches. Penial setae almost straight, moderately slender, scarcely tapering ectally except at the tip which is obtuse and rounded (worn?); the region behind the tip furrowed; the shaft further ectally bearing numerous scattered groups of small but attenuated spines which are often bifid or trifid; length = 1.5 mm, general width of shaft = 18 μ m. Spermathecae 3 pairs of unusual form: duct greatly expanded with a correspondingly enlarged internal lumen, joined by a bilobed or multiloculate diverticulum; the sac-like ampulla with one or two variably developed ectal outpouchings.

MATERIAL EXAMINED.

Lake St Clair, 146°10'E. 42°05'S. Map, 13/5, Tasmanian Biological Survey: J19, Mr R. W. Kerr, Feb 1941 - holotype TM: K378.

REMARKS. The combination of several pairs of intersegmental genital markings, 3 pairs of spermathecal pores and ectal outpouchings of the spermathecal ampulla distinct from spermathecal diverticula, diagnoses this species.

Oreoscolex wellingtonensis (Spencer, 1895)

Fig. 3, 29B, 32R; Plates 87-90. Table 19

Cryptodrilus wellingtonensis Spencer, 1895: 43-44, Pl. 3, fig. 25-27.

Notoscolex wellingtonensis; Michaelsen, 1900: 192-193; Jamieson, 1971c: 79.

l = 140, 155 mm, w = 5.8, 5.5 mm, s = 138, 149 (specimens 1 and 3).

Prostomium epilobous $\frac{1}{2}$, closed. First dorsal pore 4/5, 3/4; pores very conspicuous in the mid- and hind-body. Setae 8 per segment in regular longitudinal rows; *d* occasionally absent. Nephropores not visible. Clitellum annular, XIV-XVII. Male pores on XVIII in *a* on a large glandular pad which extends laterally beyond *b* and fills the segment longitudinally (specimen 1), this pad replaced in specimens 3-5 by two large oval papillae, each bearing a male pore. A large median oblong-oval glandular pad in 19/20 (specimens 1, 2) or 20/21 (specimens 3, 4) extends laterally beyond *b*, includes the setal annulus of the preceding segment and reaches that of the succeeding segment and is traversed by a groove corresponding with the intersegment. A similar pad present in 12/13 in specimen 3 and a suggestion of a small midventral pad median to *a* in 17/18 in specimens 1-3. Female pores paired, median to and only slightly anterior to *a*, at about $\frac{1}{3}aa$, on XIV. Spermathecal pores 2 pairs on small papillae, or concealed, in 7/8 and 8/9, in *a* lines.

TABLE 19

Intersetal distances in segment XII in *Oreoscolex wellingtonensis*

| | mm | | | | | | | |
|---------------------|--------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| specimen 2 | 1.6 | 0.5 | 1.4 | 1.3 | 8.9 | 1.1 | 1.4 | 0.5 |
| specimen 3 | 1.3 | 0.5 | 2.1 | 2.6 | 4.1 | 2.6 | 2.3 | 0.5 |
| specimen 4 | 2.0 | 0.6 | 1.8 | 1.5 | 8.2 | 1.5 | 1.8 | 0.6 |
| | standardized (<i>u</i> = 100) | | | | | | | |
| | <i>aa</i> | <i>ab</i> | <i>bc</i> | <i>cd</i> | <i>dd</i> | <i>dc</i> | <i>cb</i> | <i>ba</i> |
| specimen 2 | 9.79 | 2.98 | 8.51 | 7.66 | 52.77 | 6.81 | 8.51 | 2.98 |
| specimen 3 | 7.96 | 3.10 | 13.27 | 16.37 | 25.66 | 16.37 | 14.16 | 3.10 |
| specimen 4 | 11.16 | 3.19 | 9.96 | 8.37 | 45.82 | 8.37 | 9.96 | 3.19 |
| mean | 9.64 | 3.09 | 10.58 | 10.80 | 41.42 | 10.52 | 10.88 | 3.09 |
| interval/ <i>ab</i> | 3.12 | 1.00 | 3.42 | 3.50 | 13.40 | 3.40 | 3.52 | 1.00 |

Last hearts in XII (latero-oesophageal). Supra-oesophageal moderately developed, ending at $\frac{1}{2}$ XIII. Gizzard large, firm in V extending posteriorly to the level

of XI, oesophagus virtually suppressed to this segment; in XII–XIV with high vascular internal rugae, intestinal origin XVI, deep dorsal typhlosole commencing in XXIV (specimens 1 and 3). Nephridia: pairs of very large tufted nephridia in II–V with composite ducts; those of II apparently opening into the buccal cavity; those of III and IV and possibly V running forward to open ventrolaterally at the mouth. Nephridia in VI–IX forming smaller tufts exonephric in each segment. By XII there are dense lateral bands of meronephridia; those of segments X and XI being intermediate between tufts and these lateral bands. Caudally with very numerous exonephric (?) micromeronephridia on each side, each nephridium with a minute preseptal funnel (specimen 1). Holandric (funnels iridescent in X and XI); gymnorchous; seminal vesicles racemose, in IX and XII. Prostates linear but externally racemose, extending laterally in, and restricted to, XVIII; narrow central lumen present with few side branches. Penial setae moderately slender, sinuous, the tip flattened and widened to form a blade which is terminally straight edged with a few irregular teeth; ectal region, with the exception of the blade, with a feathered appearance produced by a series of numerous composite spines, each of which is approximately triangular but has several long and often branched lateral pinnae; length of left seta = 1.1 mm; general width of shaft = 18 μ m (specimen 1). Metagynous; ovisacs absent. Spermathecae 2 pairs; diverticulum (inseminated) sessile, multiloculate.

TYPE-LOCALITY. Mount Wellington. Map, 14/4.

MATERIAL EXAMINED.

Domain, Hobart, 147°20'E. 42°50'S. Map, 14/5, Dr J. L. Hickman, 14 Aug 1954 – specimen 1 TM: K379, 7 Nov 1955 – specimen 2 AM: W5331. Kelly's Basin, Port Davey, 145°55'E. 43°20'S. Map, 17/1, Tasmanian Biological Survey: Mr C. D. King, Jan 1940 – specimen 3 BM(NH): 1973.2.47. 'Tasmania', Dr J. L. Hickman – specimen 4 BJ: T71.

REMARKS. The new material conforms sufficiently well with Spencer's account for there to be little doubt of conspecificity. The fact that one of the new specimens is almost topotypic and that no form more closely resembling Spencer's description was found further supports the identification. Differences in Spencer's account are slight, *viz.* length < 100 mm; prostomium only slightly epilobous; male and spermathecal pores in *ab*; clitellum extending slightly onto the dorsal surface of XVIII. Accessory genital markings are said by Spencer to be swollen tumid ridges on XVIII, XIX and XX, marked differences from the present specimens, but his illustration (Plate 3, fig. 25) shows a single intersegmental marking only, in 19/20, as described in this account.

Genus *MEGASCOLEX* Templeton, 1844

DIAGNOSIS. Setae, at least in the mid- and hindbody numerous (more than 8) per segment. Prostates 1 pair, racemose, their pores on XVIII or, exceptionally, an adjacent segment; sometimes associated with penial setae. Female pores paired or exceptionally unpaired. Spermathecal pores usually 1–5 pairs between IV and IX (the exceptions are the few cases where the pores are fused in the midline, or where they are numerous on each side in each segment occupied). One gizzard, in V, VI

or VII. Calciferous glands present or absent. Meronephric, with or without enteronephric nephridia. Holandric, rarely metandric; testis-sacs present or absent. Ovaries in XIII. Spermathecae with or without free diverticula.

TYPE-SPECIES. *Megascolex caeruleus* Templeton, 1844 (Ceylon).

DISTRIBUTION. Ceylon and India. Australia, with Tasmania. New Caledonia. New Zealand. Norfolk Island. Annam.

Tasmanian species

M. burniensis sp. n.

M. montisarthuri sp. n.

M. tasmanicus (Spencer, 1895).

Other species

Sixty-five Australian species, in addition to the Tasmanian complement, are listed in Jamieson, 1971c (*q.v.*). This is a very large genus with many species in extra-Australian parts of its range.

REMARKS. *Megascolex* is a polyphyletic congeries in need of revision and constitutes one of the major problems in oligochaete taxonomy (Jamieson, 1971c). It is the type-genus of the tribe Megascolecini, purely meronephric megascolecines in which, if there is a median stomate nephridium, this opens into the intestine.

The following three Tasmanian species are provisionally retained in *Megascolex*, with the definition of which they conform, pending revision of the genus. Sufficient grounds exist to suggest that the Tasmanian species comprise one or more separate genera but erection of the latter is deferred until the mainland species of *Megascolex* are revised.

KEY TO TASMANIAN SPECIES OF *MEGASCOLEX*

- | | | | | | | | | | | | | |
|---|--|----------|---|---|---|---|---|---|---|---|---|--------------------------------------|
| 1 | Spermathecal pores 2 pairs | . | . | . | . | . | . | . | . | . | . | 2 |
| - | Spermathecal pores 5 pairs. | Fig. 30C | . | . | . | . | . | . | . | . | . | <i>M. tasmanicus</i> (Spencer, 1895) |
| 2 | Spermathecal pores median to <i>a</i> , almost contiguous ventrally. | Fig. 30A | . | . | . | . | . | . | . | . | . | <i>M. montisarthuri</i> sp. n. |
| - | Spermathecal pores in <i>ab</i> . | Fig. 30B | . | . | . | . | . | . | . | . | . | <i>M. burniensis</i> sp. n. |

Megascolex burniensis sp. n.

Fig. 4, 30B, 32F

l = 65 mm, w = 4.0 mm, s = 92.

Prostomium tanylobous. First dorsal pore 4/5. Setae 12 on XII; 24 caudally (30 counted in some segments); seta become irregular in the posterior 25 segments; $zz \doteq zy$ anteriorly but $zz \doteq 2-4zy$ posteriorly; $aa \doteq 2-2.5ab$ preclitellar, $aa \doteq 3-4ab$ postclitellar; aa not discernible as a ventral break caudally. Nephropores not externally visible. Clitellum annular $\frac{1}{2}$ XIII-XVII. Male pores on small papillae in *ab*, nearer *a*, on XVIII. Genital markings: 3 pairs of small eye-like markings

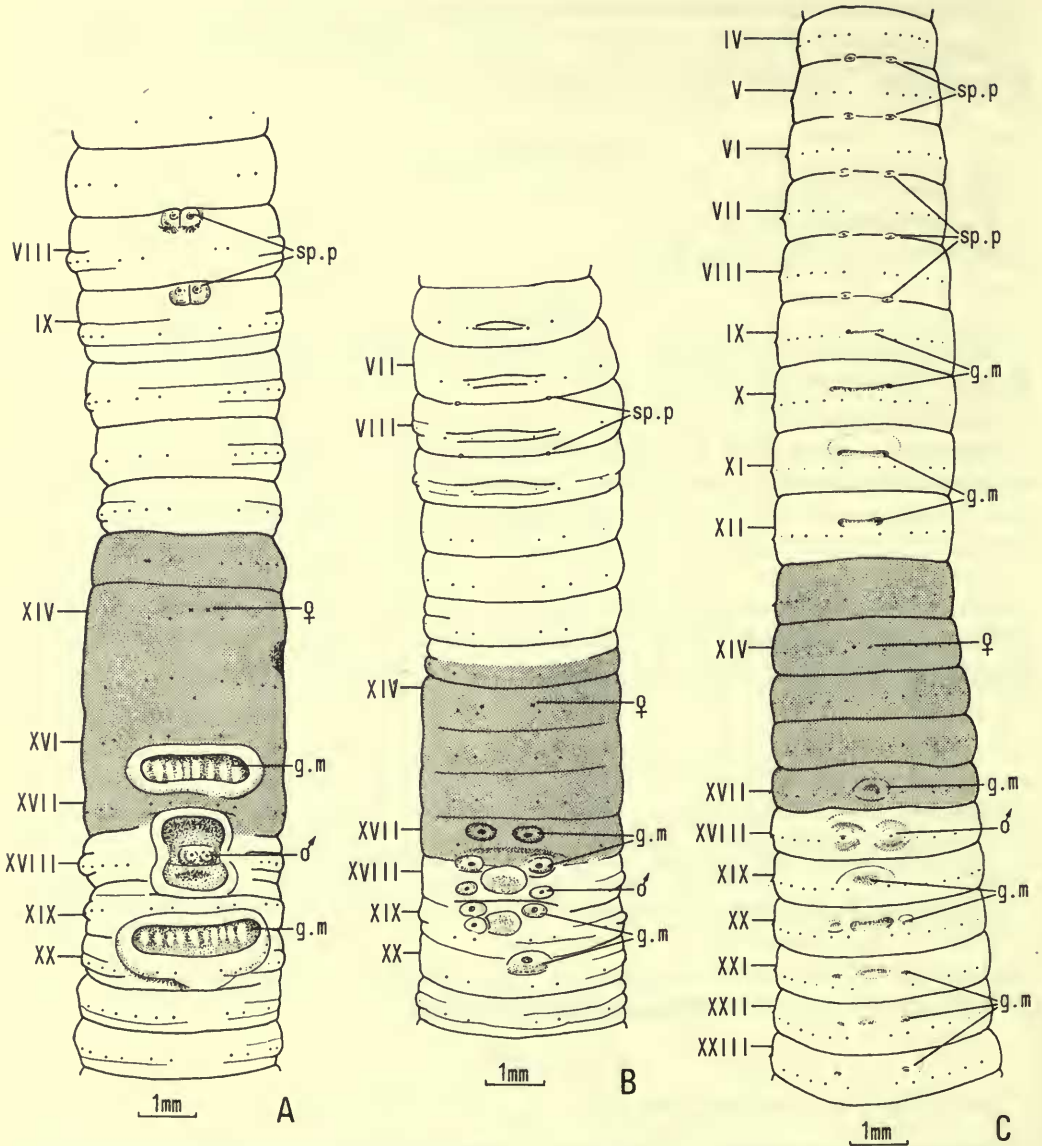


FIG. 30. Genital fields. A, *Megascolex montisarthuri*, holotype. B, *M. burniensis*, holotype. C, *M. tasmanicus*, specimen i.

with centres approximately in *a*, one pair presetal in XVII, the other two pairs in 17/18 and 18/19; two similar presetal unpaired markings with centres in *a* in XIX (right) and 19/20 (left); two larger median presetal markings present in XVIII and XIX. Female pores paired, anterior and slightly median to *a* of XIV. Spermathecal pores 2 pairs, in 7/8 and 8/9, on small papillae slightly lateral of *a*.

Last hearts in XIII (hearts in X–XIII latero-oesophageal with connective to dorsal and supra-oesophageal vessel); supra-oesophageal in VII–XIII, well developed. Gizzard large, firm, globular with anterior rim, in V. Extramural calciferous glands absent; oesophagus with circumferential vascular striae in VIII–XV; rugae increasing posteriorly, especially well developed in XIV and XV. Intestinal origin XVII; typhlosole absent. Nephridia poorly preserved; few avesiculate, exonephric meronephridia on each side in each segment; exonephric tufts in II–VII; caudally exonephric with a preseptal funnel on each side, the median nephridium somewhat enlarged. Holandric (funnels iridescent in X and XI); gymnorchous; seminal vesicles racemose in XI and XII. Metagynous; ovisacs present? (a small, flocculent mass, on the right side only, is doubtfully an ovisac). Prostates flattened and almost square, in XVII and XVIII; truly racemose, the muscular duct dividing into three immediately within the gland; vas deferens joining the duct near its ental end. Penial setae absent. Spermathecae 2 pairs, in VIII and IX, diverticulum (inseminated) single, clavate, uniloculate.

MATERIAL EXAMINED.

Fern Glade, Emu River, Burnie, 145°55'E. 41°05'S. Map, 7/2, Dr J. L. Hickman, 24 Aug 1954 – holotype TM: K380.

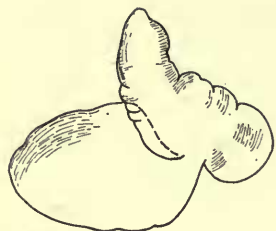
REMARKS. The genital field is diagnostic of this species.

Megascolex montisarthuri sp. n.

Fig. 4, 30A, 32G

l = 95, 105 mm, s = 3.6, 5.2 mm, s = 125, 123.

Prostomium canaliculate or not, tanylobous closed. First dorsal pore 3/4, 4/5. Setae 18 (holotype), 12 (paratype 1) in XII, caudally with 24 or more in a segment; rows regular in the fore- and midbody, with the ventral gap \doteq *3ab* and much wider dorsal gap; caudally with *aa* unchanged but other rows irregular and no appreciable dorsal interruption of the setal circlet. Nephropores not externally visible. Clitellum annular, XIII–XVII (holotype, paratype 1) with weak development in XVIII (holotype). Male pores almost contiguous midventrally in XVIII on a pair of united papillae which lie in a depression with tumid borders which extends almost from the setal arc of XVII to that of XIX and laterally reaches *b* lines; a midventral transverse glandular depression with tumid margins present in each of intersegments 9/10, 16/17 and 19/20, spanning *cc* and carrying a transverse series of whitish pore-like stigmata. Female pores anteromedian to setae *a* at about $\frac{1}{3}aa$. Spermathecal pores 2 pairs, on medianly closely apposed papillae near the anterior margins of VIII and IX.



A



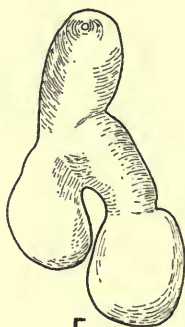
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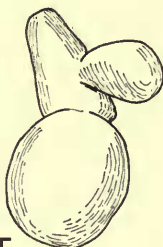
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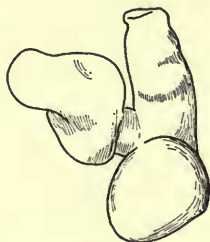
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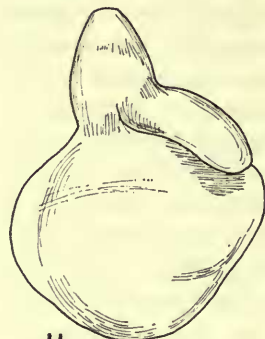
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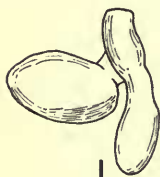
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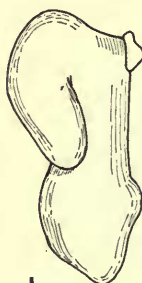
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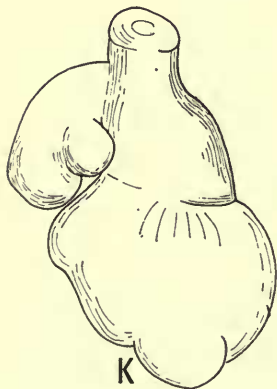
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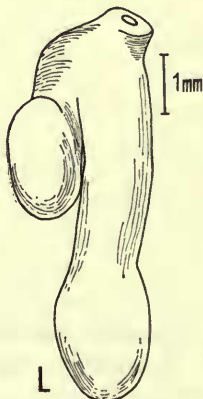
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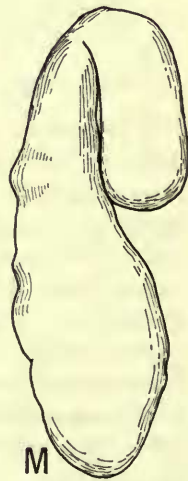
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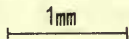
N



L



M



Dorsal vessel single ; continuous onto the pharynx ; last hearts in XII (hearts in X–XII latero-oesophageal, with connective to dorsal and supra-oesophageal vessel) ; supra-oesophageal weakly developed ; gizzard very well developed, in V but extending posteriorly into IX by displacement of attenuated septa ; oesophagus widened to form an annular calciferous gland with numerous high radial internal lamellae in XV (holotype, paratypes, 1, 8) ; similarly developed in XVI and not demarcated from that in XV in holotype, or in XIV and less so in XIII in paratype 1 ; swollen and vascular, almost reniform on each side in XVII in paratypes 1 and 8. Intestinal origin XVIII reaching full width in XIX ; typhlosole strongly developed ; first appreciable (rudimentary) in XX–XXI (holotype, paratypes 1, 8). Nephridia several exonephric, astomate, avesiculate parietal meronephridia on each side in each segment ; a large pair of tufts in III, extending into II and IV and each sending a sheaf of ducts (composite duct) to enter the parietes anterior to seta *b* of II ; caudally the medianmost nephridium enlarged as a megameronephridium with single preseptal funnel (exonephric) (holotype). Holandric (funnels iridescent) ; gymnorchous ; seminal vesicles racemose, in XI (small) and XII ; metagynous ; small ovisacs in XIV ; prostates compact, racemose, restricted to XVIII (holotype, paratypes 1, 8) with ramifying internal ducts and no dominant central duct ; vas deferens joining ectal end of duct (holotype). Penial setae absent. Spermathecae 2 pairs, in VIII and IX (the ampullae in the segment anterior to its pores in the holotype only) ; diverticulum (inseminated) small, clavate, uniloculate (holotype ; paratypes 1, 8).

MATERIAL EXAMINED.

Mt Arthur, Weldborough Pass, 1.6 miles from eastern end, 147°55'E. 41°10'S. Map, 9/3, Dr J. L. Hickman, 26 Aug 1953 – holotype TM : K381. East side of mountain 147°20'E. 41°15'S. Map, 9/1, Mr A. J. Dartnall and Mr R. C. Kershaw, 15 Oct 1971 – paratypes 1, 8, 16–18 BM(NH) : 1973.2.48–52 ; paratypes 2–7, 9–15 TM : K382–394 ; paratypes 19–25 AM : W5332–5338 ; paratypes 26–29 BJ : T72–75.

REMARKS. The closely apposed spermathecal and male pores and the very distinctive accessory genital markings permit ready identification of *M. montisarthuri* and jointly distinguish it from all other species.

Of 29 paratypes from Mt Arthur, all agree with the holotype in possessing the characteristic median transverse genital markings at 16/17 and 19/20, the median field around the two male pores being variably developed ; 25 of these have an additional transversely punctate genital marking extending laterally into *ab* in 9/10.

FIG. 31. Spermathecae of *Cryptodrilus*. A, *C. avesiculatus*, holotype (right IX). B & C, *C. brunyensis* : B, holotype (right VIII) ; C, paratype (right IX). D, *C. dartnalli*, holotype (left IX). E–G, *C. enteronephricus* : E, holotype (right IX) ; F, paratype 3 (right IX) ; G, paratype 14 (right IX). H, *C. polynephricus polynephricus*, specimen 12 (right IX). I, *C. polynephricus* ad *urethrae*, specimen 44 (right IX). J–M, *C. p. urethrae* : J, holotype (right VIII) ; K, paratype 1 (right IX) ; L, paratype 8 (right IX) ; M, paratype 20 (right IX). N & O, *C. simsoni* : N, lectotype (right VIII) ; O, specimen 2 (right IX). All except L to the scale indicated.

Megascolex tasmanicus (Spencer, 1895)

Fig. 4, 30C, 32H, I

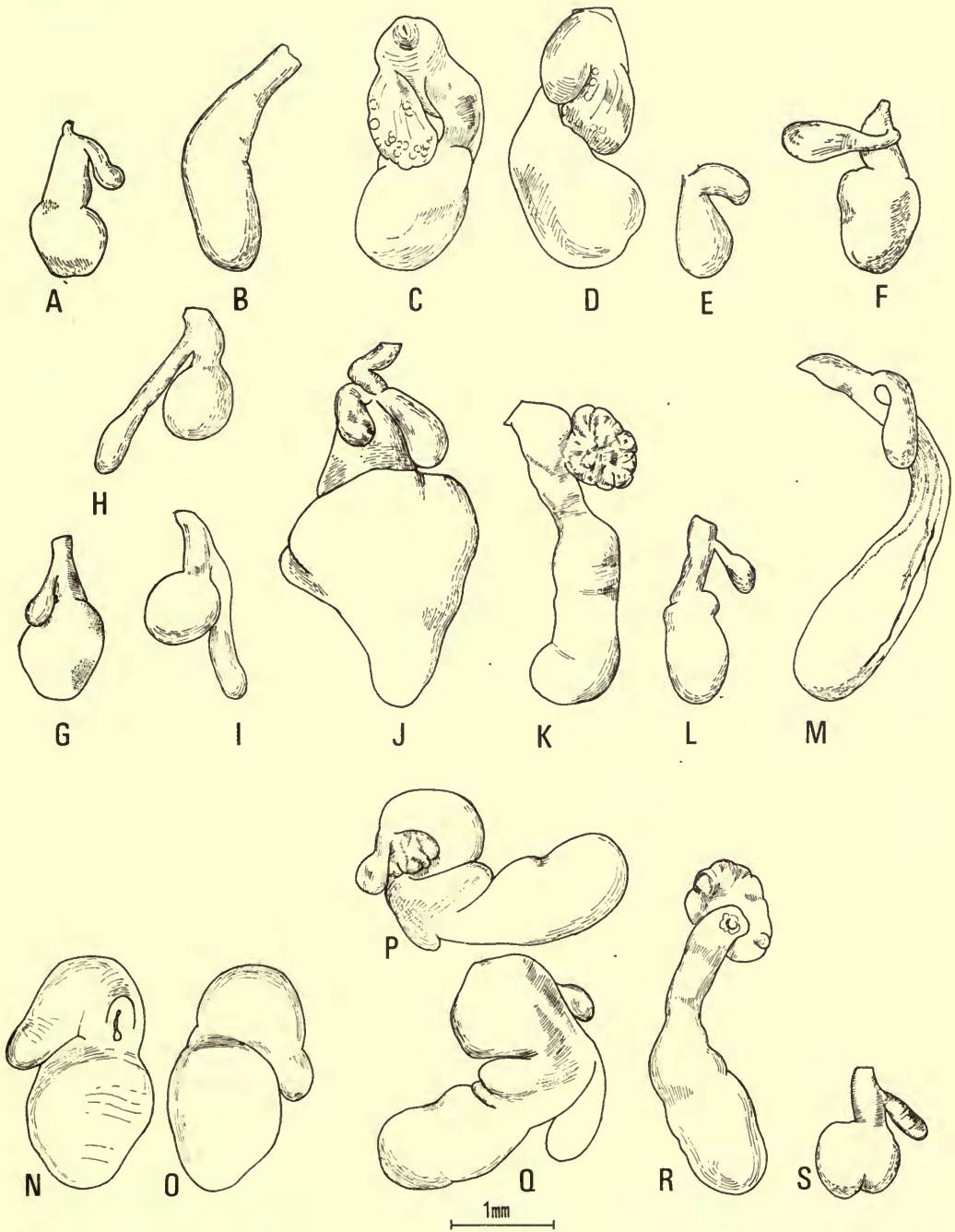
Perichaeta tasmanica Spencer, 1895: 47-48, Pl. IV, fig. 37-39.*Megascolex tasmanicus*; Michaelsen, 1900: 217; Jamieson, 1971c: 96.

l = 70, 75 mm (63-88 mm, Spencer), w = 3.5 mm (3.1 mm, Spencer), s = 89, 93 (specimens 1 and 2).

Prostomium epilobous $\frac{2}{3}$ ($\frac{1}{3}$ - $\frac{1}{2}$, Spencer), open; peristomium bifid ventrally. First dorsal pore 4/5. Setae 18 (specimen 1), 25 (specimen 2) (20-22, Spencer) in XII; 28-30 caudally (24-28, Spencer); *zz* \doteq *zzy* anteriorly, irregular caudally, forming a definite gap in the setal circlet in the fore- and midbody but inappreciable at the caudal extremity; *aa* \doteq *2ab* anteriorly, regular throughout, \doteq *3ab* caudally, a definite gap throughout; setae *a* and *b* absent in XVIII. Nephropores not externally visible. Clitellum weakly developed, annular, in XIII-XVII (as Spencer). Male pores small but conspicuous transverse slits in *a* or *ab*, on XVIII, each on the suggestion of a small papilla, in a circular, glandular, depressed field. Accessory genital markings incompletely developed but well-defined, presetal median transverse glandular bands in IX, X, XI, and XII extending maximally to *ab* (specimen 1) or rudimentary in VIII-XI (specimen 2); a presetal, median, approximately oval, depressed glandular patch in each of segments XVII-XXII; similar but paired circular presetal markings present in each of segments XX-XXIII, almost contiguous with the median marking where one occurs in the same segment (markings median in IX, X, XI, XX, XXI and XXII, Spencer). Female pores a pair in XIV, shortly anterior to the setal arc and close together at about $\frac{1}{3}aa$; spermathecal pores 5 pairs of small but distinct white-rimmed slits, in 4/5-8/9, in *a* lines.

Internal anatomy (specimen 1): dorsal blood vessel single, continuous onto the pharynx; last hearts in XII (hearts in X-XII latero-oesophageal, each with connective to dorsal and supra-oesophageal vessel); supra-oesophageal in IX- $\frac{1}{2}$ XIII, well developed. Gizzard muscular, but small and easily compressed, in V; true ovoidal calciferous glands, 3 pairs in segments X, XI and XII, each sessile, with a narrow connection with the lateral wall of the oesophagus, the lumen of the gland almost occluded by approximately 12 laminae which converge on the connection with the oesophagus but do not unite; intestinal origin XV (XVIII, Spencer); a very low but definite typhlosole present, first appreciable, though very rudimentary,

FIG. 32. Spermathecae. A, *Graliophilus tripapillatus*, holotype (right IX). B, *Pinguiculus tasmanicus*, lectotype (right IX). C & D, *Hickmaniella opisthogaster*, holotype: C, ventral view; D, dorsal view (right IX). E, *Rhododrilus littoralis*, holotype (right IX). F, *Megascolex burmiensis*, holotype (right IX). G, *M. montisarthuri*, holotype (right IX). H & I, *M. tasmanicus*, specimen 1: H, left IX; I, right VIII. J, *Oreoscolex bidiverticulatus*, holotype (right IX). K, *O. campestris*, specimen 1 (right IX). L, *O. irregularis*, specimen 1 (right VIII). M, *O. peculiaris*, holotype (right IX). N & O, *O. longus*, holotype: N, dorsal view; O, ventral view (right IX). P & Q, *O. sexthecatus*, holotype: P, ventral view; Q, dorsal view (right VIII). R, *O. wellingtonensis*, specimen 1 (right IX). S, *Pseudocryptodrilus acanthodriloides*, holotype (right IX). All to the same scale excepting E which is twice the scale indicated.



in XVI; caeca and muscular thickening absent. A few small exonephric tufted nephridia on each side in IV, small nephridia apparently present in III (and II?); astomate, avesciculate, exonephric micromeronephridia numerous on each side, forming a dense parietal band, in XV posteriorly; less numerous in V-XIV. Caudally with numerous micromeronephridia and a median nephridium which has several spiral loops and might be considered a megameronephridium. The median nephridium with a large preseptal funnel and with its duct joining a paired duct running longitudinally on the roof of the intestine shortly lateral of the dorsal blood vessel; this longitudinal duct connected to and presumably opening into the intestine posteriorly in each segment. Caudal micromeronephridia associated with preseptal bodies which may be reduced funnels; whether enteronephric or exonephric not determined. Holandric (funnels iridescent in X and XI); gymnorchous; seminal vesicles racemose, very large, in IX and XII, the larger in IX. Metagynous; ovisacs present. Prostates racemose, bipartite, one lobe in XVIII, the other in XIX, the muscular duct bifurcating immediately within the gland, joined entally by the vas deferens. Penial setae absent. Spermathecae 5 pairs, diverticulum single, longer than the ampulla, clavate, uniloculate.

TYPE-LOCALITY. Emu Bay, Tasmania, and King Island in Bass Strait. Map, 7/2.

MATERIAL EXAMINED.

Table Cape, 145°45'E. 41°00'S. Map, 7/1, Dr J. L. Hickman, 24 Aug 1954 - specimen 1 TM: K395; specimen 2 BJ: T76.

REMARKS. *M. tasmanicus* is questionably distinct from the Victorian species *M. hoggi* (Spencer 1892b) and its occurrence on King Island may indicate that it represents a Tasmanian population of the latter species. If so, it would constitute the only known case of a megascolecid species shared between Tasmania and the mainland. Spencer (1895) drew attention to the similarity of *M. tasmanicus*, *M. sylvaticus*, *M. hoggi*, *M. halli*, *M. rubra*, *M. frenchi* and *M. steeli*, all Victorian species of Spencer (1892b), in having a bifid peristomium, 5 pairs of spermathecal pores, calciferous glands in X-XII and bilobed prostates. This combination of characters suggests a basis for recognition of a new (wholly dichogastrin?) genus distinct from *Megascolex*.

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PLATES 1-12

Scanning electron micrographs of penial setae. 1, *Graliophilus tripapillatus*, holotype.
2 & 3, *Cryptodrilus avesiculatus*, holotype.
4-7, *C. brunyensis*: 4-6, one seta; 7, a second seta of paratype 1.
8-12, *C. dartnalli*: 8-10, paratype 8; 11 & 12, holotype.



1



2



3



4



5



6



7



8



9



10



11



12

PLATES 13-24

Scanning electron micrographs of penial setae. 13-19, *Cryptodrilus enteronephricus*: 13-15, paratype 1; 16-19, paratype 14.

20-24, *C. polynephricus polynephricus*: 20 & 21, specimen 3; 22, specimen 1; 23 & 24, specimen 5.



13



14



15



16



17



18



19



20



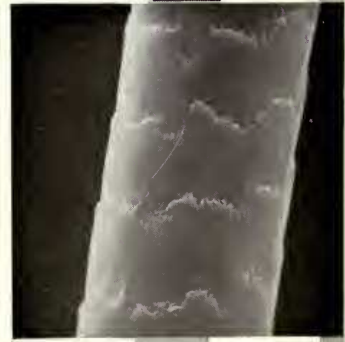
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22



23



24

PLATES 25-36

Scanning electron micrographs of penial setae. 25-31, *Cryptodrilus polynephricus polynephricus*: 25, specimen 10; 26, specimen 8; 27 & 28, specimen 24; 29-31, specimen 34. 32-36, *C. p. polynephricus* ad *urethrae*: 32 & 33, specimen 42; 34-36, specimen 44.



25



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PLATES 37-48

Scanning electron micrographs of penial setae. 37-43, *Cryptodrilus polynephricus polynephricus* ad *urethrae*: 37-39, specimen 44; 40-42, specimen 48; 43, specimen 49. 44-48, *C. p. urethrae*: 44-47, holotype; 48, paratype 6.



10µm 37



10µm 38



10µm 39



10µm 40



10µm 41



10µm 42



100µm 43



100µm 44



100µm 45



10µm 46



10µm 47



10µm 48

PLATES 49-60

Scanning electron micrographs of penial setae. 49-59, *Cryptodrilus polynephricus urethrae* : 49 & 50, second seta, paratype 6 ; 51 & 52, paratype 20 ; 53-59, 3 penial setae of paratype 1, 53, lateral view of a seta ; 54, ventral view of same ; 55, dorsal view of same ; 56 & 57, lateral and dorsal detail ; 58, lateral view of second seta ; 59, detail of third seta.
60, *Rhododrilus littoralis*, paratype 1.



10µm

49



10µm

50



100µm

51



10µm

52



100µm

53



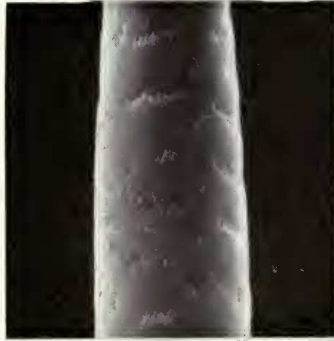
100µm

54



10µm

55



10µm

56



10µm

57



100µm

58



10µm

59



100µm

60

PLATES 61-72

Scanning electron micrographs of penial setae. 61-63, *Pseudocryptodrilus acanthodriloides*, paratype 3.

64-66, *Hickmaniella opisthogaster*: 64, holotype; 65 & 66, paratype 1.

67, *Oreoscolex bidiverticulatus*, holotype.

68-72, *O. campestris*: 68 & 69, specimen 1; 70-72, specimen 2.



61



62



63



64



65



66



67



68



69



70



71



72

PLATES 73-84

Scanning electron micrographs of penial setae. 73-80, *Oreoscolex longus* : 73-75, holotype :
76-78, paratype 1 ; 79 & 80, paratype 7.

81-82, *O. peculiaris*, holotype.

83 & 84, *O. sexthecatus*, holotype.



10 μm 82

100 μm 83

10 μm 84

PLATES 85-90

Scanning electron micrographs of penial setae. 85 & 86, *Oreoscolex sexthecatus*, seta shown in plate 83, holotype.

87-90, *O. wellingtonensis*, specimen 1.



10µm

85



10µm

86



100µm

87



10µm

88



10µm

89



10µm

90

PLATES 91-96

Scanning electron micrographs of penial setae. 91 & 92, *Perionychella (P.) capensis*, paratype 1. 93, *P. (Vesiculodrilus) bilhecata*, paratype 3. 94-96, *P. (V.) dilwynnia*: 94 & 95, Butler's Gorge Road specimen; 96, Tarraleah pipeline specimen.



10 μ m

91



1 μ m

92



1 μ m

93



10 μ m

94



10 μ m

95



10 μ m

96

PLATES 97-102

Scanning electron micrographs of penial setae. 97 & 98, *Perionychella (Vesiculodrilus) hobartensis* : 97, 14/6, BM(NH) : 1972.8.15 ; 98, 14/5, TM : K304.
99-102, *P. (V.) mortoni* : 99 & 100, left and right setae respectively of East Risdon specimen ; 101 & 102, specimen described from Shoobridge Bend.



10µm 97



1µm 98



10µm 99



10µm 100



10µm 101



10µm 102